JANUARY 4, 1930

ANNUAL PROGRESS AND STATISTICAL NUMBER

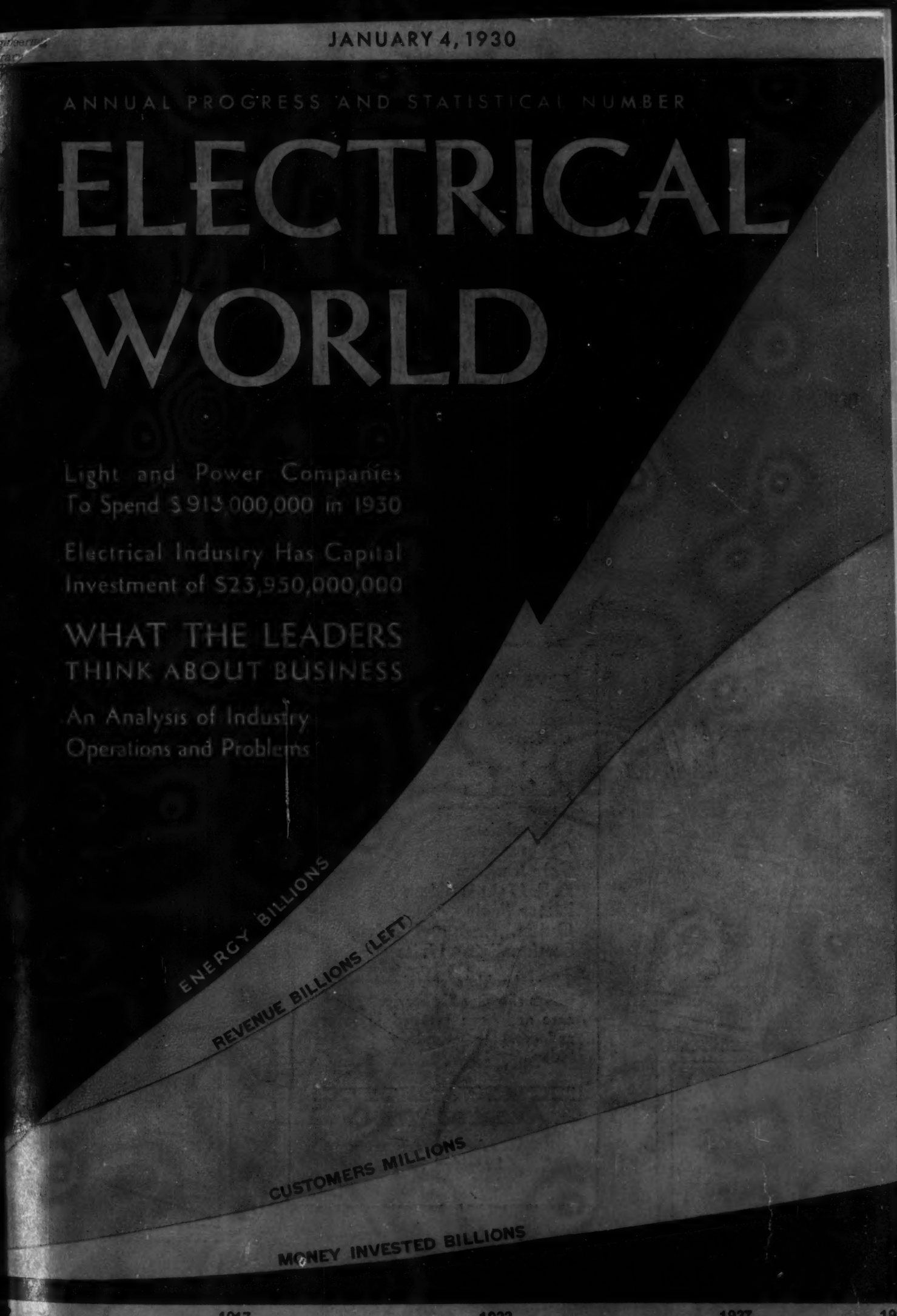
ELECTRICAL WORLD

Light and Power Companies To Spend $913,000,000 in 1930

Electrical Industry Has Capital Investment of $23,950,000,000

WHAT THE LEADERS THINK ABOUT BUSINESS

An Analysis of Industry Operations and Problems



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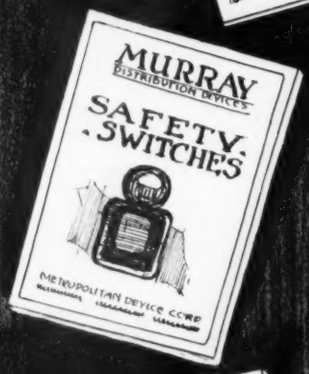

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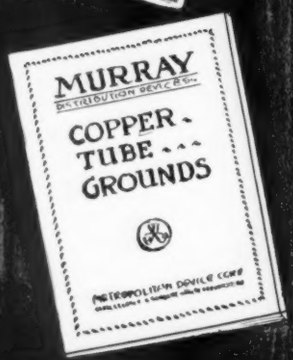

ELECTRICAL WORLD

A consolidation of Electrical World, Electrical Engineer and American Electrician

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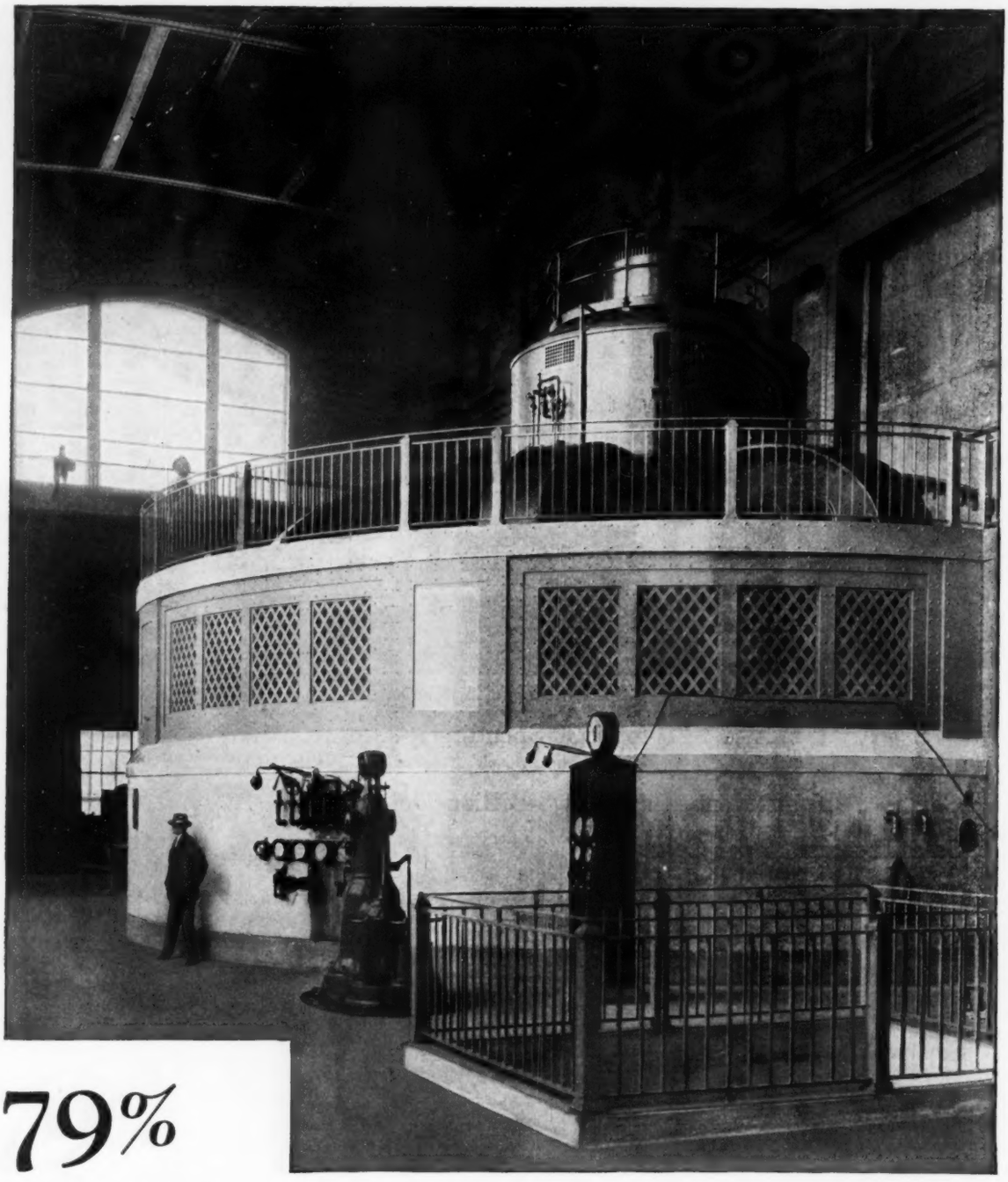

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EDITORIALS

L.W.W. MORROW
Editor

An Enduring Place in the Sun

RECORD performance and accomplishment marked the year just ended. Both are within reach during 1930, but neither may be of the same magnitude or kind. Growth and expansion will be affected somewhat but not seriously checked by general industrial conditions. The utilities and the manufacturers still lag behind the markets for their service and products. Moreover, the great budgets announced by the utilities indicate a heavy building program for 1930.

ALTHOUGH only a few of the state legislatures will convene in 1930, the electric public utilities of the country are likely to be confronted with a plethora of legislation in Congress and in such commonwealths as New York and Massachusetts. Out of the welter of investigations now under way involving the utilities and the commissions is bound to come some attempt at further regulation or restriction. Besides the Federal Trade Commission investigation, the Muscle Shoals controversy, the fight over the disposition of the water and power of the Colorado River, and the canalization of the St. Lawrence are still claimants for attention.

MERGERS are beginning to slacken in pace and interest. Some will perforce be still brought about, but consolidations predicated on naught but bankers' profits are likely to pass into the limbo of forgotten things. The bankers made handsome returns out of electric public utility flotations, and while the going was good it was a question oftentimes whether ethics and the wonted caution of bankers were not more honored in the breach than the observance. Small wonder, then, that some bankers were caught in the November slump, and if that crash had a salutary effect on the money lenders, it was not without its lesson to public utility operators also. Hereafter both will doubtless find more solace in their own business and evince less desire to stray in neighboring fields.

IN ELECTRICAL translating devices lies the greatest hope of the industry, coupled with the ability and determination of its personnel to market them. Distribution is the outstanding problem of all industry, and the electrical business is no exception. Whether it be as manufacturers or jobbers or dealers, or whether it be as purveyors of electrical energy, the basic problem clamoring for solution is the same. How can the translating device and the energy to operate it find lodgment with the ultimate consumer? Desire for them already exists—the difficulty is to find or part with the wherewithal to procure them. To meet that situation ought not to baffle good salesmen.

ANALYZED, most industrial and business problems will be found to be largely conditions of the mind. Their solution is not, therefore, impossible. An industry as dynamic and energetic as that based on electricity must and will be on the move. How far it will move this year depends not so much on circumstances as on the leaders and commercial men themselves. Last year's business was greater than the industry anticipated. This year's growth may not come so easily, but what is worth having is worth striving for. Besides, work is an excellent remedy for imaginary ills, and most of the troubles of business at this time are of that kind.

The Electric Heat Inhibition

HOW many electric utilities in the United States really want to take on industrial heating load in large volume? In strict honesty one is forced to admit that the number cannot be large, or, at least, one can get no other impression from the present national proportions of the load. Here is an outlet for electrical energy that, potentially, is larger than any present one, a class of business of high load factor and high power factor that should be most acceptable on any system. Yet industrial electric heating as a central-station service expands only slowly. Why?

The most serious obstacle in the way of expansion of the load is the mental attitude of central-station executives. They have reason for this attitude. They must not permit any class of load to assume disproportion either in their thinking or on the system they administer. Perhaps in not a few cases the pull on this check rein of reason is reinforced by the disposition to let new business come rather than to go after it.

The result is that the new-business departments of central-station companies are forced to undertake the building of the industrial heating load without having behind them the push of executive interest. This is not to say that central-station executives should encourage and sponsor methods of commercial action that have not been proved to be in the best interest of the industry, however successful that kind of action may be in other businesses. But they should strive to envisage the progress of the industry as depending more on sales effort in the future than it has in the past.

When Crises Call

SELF-SACRIFICING loyalty to the service of the public springs into alert usefulness in every crisis which descends upon the modern power company. Today the industry looks toward Maine and New York, as the utilities of these states emerge from the struggle brought upon them by sleet storms likened by veterans of the World War, as regards destruction of trees, to shell fire in the Argonne Forest. Service had to be restored to every customer at the earliest possible moment, and nothing else counts. The value of reserve steam power near important urban centers is demonstrated afresh, and there is food for engineering thought in the vulnerability of distribution lines in tree-covered districts. These problems can be attacked in good time. At the moment the uppermost feeling is a thrill of pride over the marvels which are achieved by determined men and women whose devotion to their companies transcends work for hire, makes light of sleepless nights on duty and proves the unity of the industry's purpose for service.

The Year in Electrical Engineering

MANY outstanding, even startling achievements, of which the electrical engineering profession can be justly proud, stand to the credit of the year just closed. Single-unit generators of such enormous capacities that only a few years ago they would have been considered redolent of Baron Munchausen have been built and placed in service, and million-kilowatt plants containing only five units are now looked upon as a coming matter of course. In the switching field the first actual successful tests on heavy-capacity oilless breakers of both the "Deïon" and the compressed-air type were reported, marking the beginning of what may become a new switch industry. The portable cathode-ray oscillograph made it possible to obtain a number of photographs of lightning, thus putting the whole study of that phenomenon on a rational basis. The widespread use of type-H cable marked a considerable reduction in cable failures, and in the field of overhead construction there may be noted some new large single-piece insulators. Electric welding made such rapid strides that one may be permitted to speak of the beginning of a revolution in steel construction.

The inside colored lamp and the new ultra-violet unit no doubt represent the most important achievements of the year in the field of illumination, and the installation of outdoor metal-clad switchgear marks another notable development in switching. But the feature for which 1929 will be remembered principally in the history of electrical engineering is the successful operation

for the first time of a large system with the generators synchronized at the load.

Despite the fact that major lines of electrical apparatus have been developed and perfected, each year brings new kinds of electrical products into being, and alike in power, in communication and in transportation engineers find new methods of assembly or operation that reach toward the goal of perfection. These developments parallel the business growth of the industry and are fundamental stepping stones to further progress.

Adequate Steam Capacity Essential

NOTWITHSTANDING an increase of more than 700,000,000 kw.-hr. in the energy output of public utility plants in September as compared with the corresponding month a year ago, the contribution from water power fell short by 300,000,000 kw.-hr., calling for an increase of over 1,000,000,000 kw.-hr. from fuel-burning plants. The increase is equivalent to 23 per cent.

There is a feeling that, as a matter of national economics, our water powers ought to be developed to the utmost. This is a sound view. But the inferences drawn from it are not always sound. It is assumed that this development will bring about cheap power. Aside from the fact that most of the major water-power resources are many miles distant from the center of population, it is not so fully recognized as it should be that unless there is to be an occasional power famine hydro plants must be supplemented by steam plants. In some instances a 50 per cent margin in steam capacity is maintained, based on lowest water-flow records.

The fact overthrows an opinion, apparently held by not a few men prominent in public life, that the price to be received for energy from publicly owned hydro plants is a measure of the value of energy in general. No one should ignore the necessity of building an adequate steam reserve. Upon utility operators the inevitable occasional scarcity of water forces the building of steam plants to meet, not average, but abnormal conditions, so that there shall be no lack of service in a pinch.

To manufacturers of various forms of equipment used in steam plants these facts show that under no conceivable economic condition in which this country may find itself for many years to come will there be any serious retardation in the building of fuel-burning plants.

The ELECTRICAL WORLD for the New Year

A BRIGHTER and still more interesting ELECTRICAL WORLD will be published in 1930 with new and modern typography. It is easier to read, more logical in the arrangement of contents. The editors will follow the electrical engineer and his interests wherever he appears and will contribute to the progress of all branches of the electrical industry.

National and foreign electrical news and pictures will be a feature, for an increased interest by our readers in what is going on in the whole world of electrical engineering is very evident. The editors will comment on important events and endeavor to establish their significance. A large group of correspondents will supply accurate news from all centers, and this material will be condensed and displayed to give a comprehensive survey in an appealing manner.

Every item will have close scrutiny and will be edited with the view of saving the time of the readers while withholding no essential detail. Illustrations will be chosen carefully and effectively displayed. Much study and experimentation have gone into the plan.

Editorially, too, progress it to be the thought in mind. Additions to the staff will be made, and a program has been devised to retain all the merits of the past and to add valuable data upon engineering policies, finance and sales that shall be both helpful and informative. Each branch of the industry is to have its major doings recorded and interpreted. The editors pledge their best thought and effort to the development of material that will help the electrical industry along the path of rapid and intelligent achievement.

COMPLETE HOME SERVICE

The Goal of the Industry for 1930

© *Ewing Galloway*

PRESENT BUSINESS		AVAILABLE BUSINESS
19,700,000	Customers	21,800,000
10,100,000,000	Energy Sales	18,000,000,000
$656,000,000	Revenue	$840,000,000
$1,546,000,000	Value of Appliance Used	$2,898,000,000

REQUIRES TEAM WORK IN AGGRESSIVE SELLING

Progress and Prospects

1929 — 1930

BUSINESS BETTER THAN USUAL. All branches of the electrical industry prospered during the past year and look forward to good business in the coming year. Reports from executives supplemented by actual figures on expected expenditures and sales show that the industry is going forward courageously. The use of electricity and electrical products is merely nominal as compared to the markets yet to be sold. Thus it is evident that the industry should go forward even more rapidly than general business.

A $24,000,000,000 INDUSTRY. Conservative estimates of the capital invested in the major divisions of the electrical industry at the end of 1929 is $23,950,000,000. Light and power leads with $11,100,000,000; electrical manufacturers, $3,680,000,000; communication, $4,780,000,000, and railways, $5,500,000,000. These figures are very large for an industry that is only 56 years old, yet the important problem is to find the money needed in the future. This will be a staggering sum, yet it will be obtained readily if earnings are maintained.

REGULATION NEEDS STUDY. In the regulatory and political horizon of the utilities it is expected that 1930 will be more active than 1929. In Congress and in many states changes in regulatory laws will be proposed. There will be increased attacks by agitators and there will be greater need than ever for the public to have an understanding of the utility business so that it will not be led astray. No time was ever more appropriate for an unbiased study of utilities and utility policy in this country and a report that will guide the public and the legislators. Some agency should call together the leading minds of the country to study the situation and bring forth recommendations.

POWER IN INDUSTRY. Only 9,000,000 hp. of the total of 40,000,000 hp. in the 175,000 industrial plants of this country is non-electrical. Each wage earner is now using approximately 5 hp. and is producing a value of product aggregating $7,500. This large use of power follows economic developments and the installation of a national electrical power supply that makes power available in any locality at about the same cost.

TRADE PRACTICES IMPROVED. Electrical manufacturers have standardized equipment greatly and brought forth new designs and new apparatus as a result of well-organized research. In general they are in better shape than ever before and are operating more efficiently. A new trend is toward better trade practices, with or without governmental cooperation, and this should stabilize the situation, especially if it is tied to production statistics. Another encouraging feature is the development of export electrical business on a permanent and sound basis.

LESSONS TAUGHT. Undoubtedly the past year taught the light and power industry many needed lessons and placed it upon a more constructive and more intelligent basis. The stock market crash was wholesome. It stopped ill-

advised mergers, speculative financing, public misconceptions of earnings, inability to raise money, and caused attention to be focused on the fundamentals of the business instead of stock values. It has cleared the air so that money can be raised, legitimate consolidations made, the banker's function in management fixed and sales efforts accelerated.

INDUSTRIAL HEATING SALES. In 1928 fifteen utilities sold 922,000,000 kw.-hr. for industrial heating. This was 10.4 per cent of their total power sales, and one company had the high percentage of 38.9. The N.E.L.A. industrial heating committee cites these data to show what can be done in this most promising field.

SLOW BUT SURE PROGRESS. Unit values in the light and power industry in 1912 and 1929 show a steady increase in economic efficiency. A typical list is as follows: Kilowatt-hours per customer, 3,000 to 3,800; revenue per customer, $79 to $87; kilowatt-hours generated per kilowatt, 2,230 to 3,100; investment per unit of generating capacity, $373 to $325; investment per customer, $597 to $458. These economic gains were obtained in the midst of a big expansion program involving extensions of service into lightly loaded areas.

A RECORD BUDGET. The 1930 budget of the utilities amounts to $913,000,000 — a record for the industry. Past experience indicates that utility building must go on steadily in conformity with the trend curve of load growth. The exceptional increase in load during 1929 indicated a need for more facilities, and appropriations were made to get them. The next problem is to raise the money and to place the orders. Financial markets are not yet in shape to absorb securities despite low money rates, but utility surplus funds are available to meet initial expenditures. It is well, therefore, to place orders now instead of delaying, for the critical period in 1930 will be the first three months and the utilities can help general business greatly by making purchases promptly.

CUSTOMER SALES DOWN. Only $145,000,000 was the amount received from sales of securities to utility customers in 1929. This was the lowest figure recorded since 1922. These data show that the utilities slackened their efforts to secure customer sales and put more of their financial effort into the stock and bond market. The past year was exceptional in the general security market in that securities could be sold in volume at a very low cost. Thus customer-ownership sales suffered. During the coming year, however, conditions are favorable to an increase in customer-ownership sales. Most of the capital structures are now shaped so that preferred stocks can and should be issued to raise new money. In addition, the general security market is not so receptive to stock issues. Customer security sales should form a very tangible back log in financing, and beyond this they bring into play the idea of customer ownership and interest, so desirable from a public relations point of view.

AMAZING FIGURES. In 1929 the 24,257,000 customers of the light and power companies caused 92,700,000,000 kw.-hr. to be generated and paid the utilities a gross revenue of $2,107,000,000. Not content with these enormous sales figures, these utilities sold securities amounting to $1,460,000,000 for new capital and refunding purposes and spent $866,000,000 of new capital for additional facilities. The industry story continues—spend more to get more, provide additional facilities to carry energy to those unserved, build better to have those on the lines wholly satisfied.

VOICES ACROSS THE SEA. Ship-to-shore communication is the latest feat of telephone engineers. Add to this commercial transatlantic telephone communication and many new technical improvements in all fields to find the sum total of progress. The communication branch of the industry ranks high in achievement and initiative. Theodore N. Vail's dream of a unified organization of radio, telegraph and telephone seems about to be realized.

A Memorable Year

Electrical industry's jubilation over Edison's tremendous achievement varied in 1929 by contacts with the acute angles of politics. Achievement continues unabated

By FRANK C. WELLS

News Editor "Electrical World"

JUBILATION and contention blend in the history of the electrical industry of America in 1929. The jubilation arose with the fitting celebration of the semi-centennial of the incandescent electric light and the accompanying tribute to the veteran who in his young manhood laid the cornerstone of the industry and has lived to see the child of his brain mew (in Miltonic phrase) its own mighty youth. The strife inhered in the compulsion thrust upon the industry to defend itself against attacks inspired by its size, its twentieth-century policy of consolidation, and the fear that it might dominate government and thus imperil democratic institutions.

Inquests, Inquiries, Investigations

Utility companies in general and light and power companies in particular were the targets for national, state and local inquests of various kinds and with various objects. A chorus of radical press comment, based largely on the classic principle of Nonsense Land—"verdict first and trial afterward"—accompanied the hearings, and impressionistic drawings of the Power Trust's ogreish features were declared to be triumphs of photographic realism by Nebraska senators, a quixotic former governor of Pennsylvania and scores of lesser statesmen. If the man in the street did not learn to

> walk in fear and dread
> Because he knows a frightful fiend
> Doth close behind him tread,

it must have been because the Age of Fable has departed.

The most important and far-reaching of the inquiries, that conducted by the Federal Trade Commission at the behest of the United States Senate, opened the year in a condition of virtual blockade and closed it the same state of partial frustration. This was due to the court proceedings resorted to by the Electric Bond & Share Company to prevent the commission from seizing records which the commission asserted to have and the company asserted not to have a bearing on the matters upon which light is being sought. The points raised still await final judicial determination; other companies are disposed to await the outcome before complying with all the commission's requisitions, and the magnitude of the undertaking and

limitation of personnel have aggravated the leaden feet of procedure. The propaganda phase of the hearings came to a close in the fall, after various bygone publicity and political activities of power companies on the Pacific Coast and elsewhere had been canvassed in the same manner as in 1928.

State legislative investigations included one by Massachusetts covering on general lines the utilities of that state and one by New York into the laws governing the State Public Service Commission and proposed ways by which they can be improved. Both of these investigations are at the time of writing incomplete, though recommendations based upon them are due at the legislative sessions that open this month. Of the two, the New York inquiry has been the more fertile, and it may bring about changes in the regulatory law.

A special committee of the Wisconsin Legislature investigated the water-power law of that state. It recommended by a majority of one a state ownership amendment to the constitution.

An inquiry, still incomplete, by the New York Public Service Commission into submetering in New York City attracted attention in other large communities where a similar problem exists, and some valuation proceedings before the commissions of Massachusetts, California, Oregon, Alabama, Georgia and other states had an interest beyond territorial boundaries because of the issues involved.

Power Commission's Troubles

Quite as fruitful a source of copy as the Federal Trade Commission was another Washington bureau—the Federal Power Commission. Three projects in particular plagued it in 1929, and disposition of none of them has yet been made. One is the Cumberland Falls project in Kentucky, over which scenery conservationists and utilitarians have locked horns; the second, the Potomac River project, where the same condition obtains; the third, the Flathead Lake project on an Indian reservation in Montana, where a scheme to manufacture fertilizer has interested the farmers—especially those who raise their crops on the floor of the United States Senate. Here, too, a deadlock exists, the Montana Power Company and an individual friend of agriculture being the contestants.

A dispute over the accounting procedure of the commission has also caused clamor. The commission's accountants are believed by political radicals to have exposed the setting up by water-power companies of excessive capitalization credits to cover pre-license expenditures. Starved for personnel, the commission has at length been forced to turn to the departmental accountants for help, and in this is seen the sinister hand of the "Power Trust" seeking to replace wise and experienced estimators by novices over whose eyes wool can be pulled.

Controversy over Muscle Shoals—that hardy perennial—is heard again in preliminary rumblings, and President Hoover is quite likely this year to have an opportunity to show whether his views coincide with those of President Coolidge where veto of the Norris public ownership bill or one resembling it is concerned, or whether in this regard he is of a more accommodating disposition than his predecessor. As for Boulder Dam, this familiar denizen of Washington's marble halls has reached a new stage marked by the plans for the division of Colorado River water and power put forth by the Secretary of the Interior; but from the Western territory concerned come reverberations which show that the seven-state shindy has not even begun to be over, and Mr. Wilbur may be left holding the hornets' nest.

Another federal bureau so conceived as to denote worry for the electrical industry is Senator Couzens' proposed Communications and Power Commission, the bill establishing which is now the subject of hearings before the interstate commerce committee of the Senate. Originally a radio, cable, telegraph and telephone bill only, Mr. Couzens had the brilliant thought of giving to the commission he desires to establish jurisdiction also over the interstate transmission of power. He was said in December, however, to be weakening in this idea, and as the year begins President Hoover's plan of conditional jurisdiction by the Federal Power Commission seems perhaps more likely to become a law, if either proposal does.

In the Political Mill

Added to the atmosphere of investigation was the fact that 1929 was a field year in politics, all save a very few of the 48 states holding legislative sessions and all save a very few of these sessions concerning themselves actively with laws affecting utility companies. As the smoke died away, however, the conflict was seen to have been singularly bloodless. Good proposals and bad ones alike fell short of enactment. Measures to abolish or weaken commissions, to spread public ownership, to tax and hamper utility companies unduly, went down to defeat in state after state.

Surely parturient mountains have seldom brought forth smaller mice. West Virginia got what looks like a good water-power law; Maine at last agreed to submit her prohibition of the exportation of hydro-electric power to the voters (who, unfortunately, later on proved so unenlightened as to sustain the embargo); New York maintained her stalemate on St. Lawrence development; Texas, Florida, Kentucky and Delaware refused to establish public utility commissions; New Jersey once more blocked the tri-state Delaware River treaty; Washington legislators defeated the initiated district ownership bill, which will go before the voters next fall just the same; Massachusetts sidestepped "regulation by contract"; Nebraska, Wisconsin, Minnesota, Indiana, Illinois and other commonwealths slaughtered whole litters of innocents commended for adoption by municipal leagues and individual reformers; Georgia defeated taxation measures aimed at gross receipts of utility companies. And so it went.

Capacity Grows from Water and Steam

Work went forward steadily on such great hydro-electric undertakings as those of the Associated Gas & Electric Company on the Saluda River in South Carolina and of the New England Power Corporation on the Connecticut at Fifteen-Mile Falls. Work, hampered by suits, was in its initial stage on the North American Company's plant on the Osage River in the Missouri Ozarks. Other notable dams reported as on the way to completion included the Arkansas Power & Light Company's Carpenter Dam on the Ouachita, the Central Maine Power Company's dam on the Kennebec and the Alabama Power Company's dam on the Lower Tallassee, Many other hydro-electric plants are being built, and

still more have passed the preliminary planning stage.

Steam-electric installations of especial note include several on the Pacific Coast, where water power once reigned with no real rival. The Great Western Power Company completed a large steam unit in San Francisco and the Pacific Gas & Electric began to install another, while continued steam expansion went on in Los Angeles. The Georgia Power Company is to have a large steam plant near Atlanta. Record-breaking units at State Line, in the Chicago territory; Hell Gate and East River, New York, and Philo, Ohio, were described. Every week saw new networks and interconnections. Saturation is still the baseless fabric of a pessimist's dream.

Electrification and Drought

The year showed marked progress toward the electrification of steam railroads. Before January was over trains were running on a 75-mile section of the Great Northern, including an 8-mile tunnel in the Cascade Range, 100 miles east of Seattle. Then activity shifted to the Eastern States, and December saw extensive plans of electrification under way by the Pennsylvania, New York Central, Delaware, Lackawanna & Western, Lehigh Valley, Philadelphia & Reading and Grand Trunk roads. Of these the most interesting so far, because of its extent and the advanced stage of preliminary work, is the coming all-electric route of the Pennsylvania from New York to Washington.

Few years have seen simultaneously so small a rainfall in the summer and fall on both the Atlantic and the Pacific Coast as 1929. October saw a substantial increase of precipitation in the East, where the abundance of steam plants had, anyhow, made it easy to care for a shrinkage in hydro-electric output. California easily and Oregon quite readily took care of the shortage in those commonwealths by a switch to steam. But in western Washington the situation was more severe. Private companies and the city of Seattle, which has fair-sized steam reserves, worried little, but the Tacoma municipal plant was forced to appeal to the United States Navy to come to its relief by anchoring the airplane carrier *Lexington* in the Puget Sound inlet so that its generating plant could be connected with the municipal system. This was done in the middle of December. Electrical industry leaders everywhere did not fail to point the plain moral. Hydro-electric plants, however large, cannot any longer be relied upon as an absolutely sure source of power.

Canada, Europe, Japan

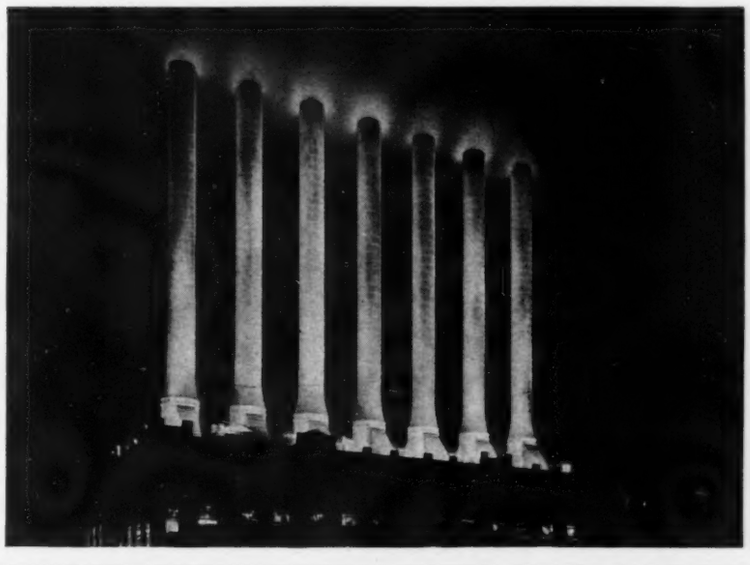
Perhaps Canada can be excepted from this dictum, though British Columbia at least felt the pinch. Ontario, Quebec and Manitoba are so plentifully endowed with water power and it has been developed so amply in those provinces that it would be an emergency indeed that would force any general resort to steam. Progress of the coming great Beauharnois plant on the St. Lawrence, beginning of the Seven Sisters development in Manitoba and substantial contracts entered into by the Ontario Hydro-Electric Power Commission for the purchase of power from Quebec developers were among important Dominion happenings recorded.

From Europe such items as the advance of the electricity unification plan in Great Britain and the virtual completion of the Shannon hydro plant in Ireland were of real interest to Americans. The Engineering Congress at Tokyo in the fall attracted scores of technical visitors from the United States.

Conventions were, as usual, many and fruitful. The National Electric Light Association initiated the method of having distinguished foreigners and other absentees appear as spokesmen in talking films—an innovation seized upon for imitation by kindred associations.

Death Takes Industry Leaders

Unusually long for a single twelvemonth is the list of well-known engineers and executives of the electrical industry who ceased from labor in 1929. Brush of arc-light fame; two other octogenarian pioneers, Andrews and Pope; Semenza of Italy; Murray, Lieb and Edwards of New York City; Baurhyte, Kerckhoff, Kennedy and Brackenridge of Los Angeles; Searle of Rochester, Anderson of Milwaukee, Fynn of St. Louis, Huntington of Spokane, Hutchings of Philadelphia and many other men of light and leading have left the industry the poorer for their departure. Their discarded mantles will be worthily worn by the younger men at whose feet they fell.



Outstanding Facts

Figures are on electric light and power industry for the year's operations or as of the end of each year

	1907*	1912*	1917*	1922*	1927*	1928	1929	†1930
Capital invested, aggregate ($1,000)	1,367,239	2,289,622	3,245,185	4,817,000	*9,500,000	10,300,000	11,100,000	.....
Securities sold, ($1,000)*	.....	.....	.....	719,961	2,152,527	1,653,180	1,390,000	.....
by investment houses ($1,000)*	.....	.....	.....	589,961	[3]1,889,000	[3]1,471,498	[3]1,315,458	.....
direct to customers ($1,000)*	.....	.....	.....	130,000	263,527	181,682	[1]145,000	.....
REVENUE, total gross ($1,000)	175,642	302,116	526,894	1,072,120	1,963,664	.....	.....	.....
for electric service ($1,000)	169,615	[4]286,981	[4]502,060	[4]1,020,439	1,802,655	1,941,955	[2]2,107,000	†2,270,000
domestic ($1,000)	125,755	221,200	402,263	842,566	546,809	597,740	[1]656,000	.....
small light and power ($1,000)					517,341	554,364	[1]599,000	.....
large light and power ($1,000)	[5]30,499				461,496	503,451	[1]552,000	.....
municipal street lighting ($1,000)	([6])	29,777	36,652	49,151	77,199	83,161	[1]90,000	.....
railroads and railways ($1,000)	7,841	31,020	53,524	48,444	64,200	63,700	[1]64,000	.....
other utilities ($1,000)	5,520			75,011	135,610	139,539	[1]146,000	.....
from other sources ($1,000)	6,027	15,135	24,834	51,681	161,009	.....	.....	.....
EXPENDITURES								
Additions and extensions ($1,000)*	.....	.....	.....	324,016	760,353	786,977	866,344	913,575
Operating, total [2] ($1,000)	99,854	151,270	308,214	533,068	828,168	866,350	[1]942,000	†1,000,000
Salaries, average ($ per year)	743	771	902	1,409	1,461	.....	.....	.....
Officers	1,250	1,760	2,211	3,287	[7]1,735	.....	.....	.....
Superintendents and managers	1,160	1,353	1,662	2,415		.....	.....	.....
Clerks	646	731	825	1,344	[7]1,450	.....	.....	.....
Wage earners	683	692	833	1,312	.....	.....	.....	.....
ENERGY								
Output (1,000,000 kw.-hr.)								
Generated by central station co's	5,862	11,569	25,438	43,560	74,686	82,927	[1]92,737	†102,000
from fuel	.....	.....	.....	26,573	45,968	49,419	[1]59,124	.....
from water power	.....	.....	.....	16,987	28,718	33,508	[1]33,613	.....
Imported, net	.....	.....	*1,225	*862	3,772	1,587	[1]1,600	.....
Total generated and imported	.....	11,569	26,663	44,422	78,458	84,514	[1]94,337	.....
SYSTEMS, STATIONS, RATINGS, ETC.								
Number of establishments	4,714	5,221	6,542	6,355	4,355	4,063	[8]2,801	.....
Commercial establishments	3,462	3,659	4,224	3,774	2,137	2,153	[8]1,480	.....
Municipal establishments	1,252	2,581	2,318	2,581	2,198	1,910	[8]1,321	.....
Companies generating	4,487	4,714	5,124	4,389	2,331	2,394	[8]1,699	.....
purchasing all energy	227	507	1,418	1,966	2,004	1,669	[8]1,102	.....
Operating systems with 100,000,000 kw.-hr. output	.....	.....	.....	6	124	135	.....	.....
Generating plants, total number	4,731	5,221	6,542	5,444	4,801	4,352	4,250	.....
Commercial	.....	3,659	4,224	3,615	3,589	3,232	3,190	.....
Municipal	.....	1,562	2,318	1,820	1,207	1,120	1,060	.....
Generator rating, (Kw.)	2,709,225	5,165,439	8,994,407	14,313,438	25,811,305	27,698,305	29,550,000	†31,400,000
Estimated equivalent Kva.*	3,262,500	6,450,000	11,230,000	17,960,000	29,629,000	31,796,822	33,900,000	†36,800,000
Prime movers, (hp.)	4,032,365	7,530,044	12,936,755	20,296,235	35,710,128	39,069,800	41,601,800	.....
Steam engines and turbines (hp.)	2,627,450	4,949,778	8,449,076	14,171,222	25,317,577	27,360,000	29,512,000	.....
Water wheels, (hp.)	1,349,087	2,469,231	4,277,273	5,822,018	9,844,263	11,119,800	11,439,000	.....
Internal combustion engines (hp.)	55,828	111,035	210,406	302,995	548,288	600,000	650,000	.....
Water power, all uses, (hp.)*	3,250,000	4,770,000	6,800,000	8,270,000	12,296,000	13,571,530	13,870,000	.....
Transmission (circuit miles)	.....	.....	.....	86,290	185,449	†204,000	†225,000	.....
Employees, total	47,632	79,335	105,541	150,762	251,020	†265,000	†279,000	.....
FUEL CONSUMPTION								
Coal and coke, (short tons)	.....	.....	21,565,273	26,130,865	37,500,630	37,593,322	41,794,000	.....
Oil (bbl.)	.....	.....	6,158,219	11,855,969	7,145,798	6,852,352	9,477,000	.....
Gas (1,000 cu.ft.)	.....	.....	14,199,204	20,174,385	65,522,792	77,054,261	112,672,000	.....
ENERGY DISPOSITION (1,000,000 kw.-hr.)								
Sales, domestic	1,870	2,572	4,530	9,560	8,073	8,970	10,100	.....
small power and light					13,318	14,042	15,900	.....
large power and light	1,500	3,254	12,560	20,620	33,708	37,377	42,737	.....
municipal lighting	([6])	([6])	([6])	([6])	1,741	1,816	2,000	.....
railways and railroads	1,160	3,017	4,400	5,642	6,772	6,750	6,800	.....
company use and losses	1,131	2,546	5,140	8,600	14,845	15,559	16,800	.....
CUSTOMERS								
Total number	1,946,979	3,837,518	7,178,703	12,709,868	21,790,238	23,219,513	24,257,159	†25,280,000
Domestic lighting*	1,526,579	3,100,918	5,810,300	10,211,232	17,698,024	18,860,465	19,721,486	†20,500,000
Commercial lighting*	400,000	605,600	1,125,200	2,030,324	3,159,214	3,332,447	3,456,434	†3,650,000
Industrial power and other*	20,400	131,000	243,203	468,312	933,000	1,026,601	1,079,239	†1,130,000
People in electric lighted homes*	7,500,000	14,000,000	25,250,000	43,100,000	75,500,000	81,500,000	85,000,000	†87,000,000
Per cent of total population*	8.0	15.9	24.3	38.9	63.0	67.5	70.0	†71.5

Data for 1907, 1912, 1917, 1922, 1927 are from U. S. Census Bureau, except those marked.
†Estimated, based on past growth or known plans.
[1]Estimated, based on ten month's operations.
[2]Does not include interest, taxes, depreciation or sinking fund.
[3]Includes rights.
[4]Includes estimated value of free service, not tabulated below.
[5]Includes miscellaneous, 1,987.
[6]Included in "lighting".
[7]Commercial companies only.
[8]Very small ones omitted, est. 600 private, 400 municipal.

Financial and Merger Outlook

By M. S. SLOAN

President National Electric Light Association

THE net result of President Hoover's conferences with business men and succeeding conferences under the leadership of the United States Chamber of Commerce is the showing that business is sound and will go forward normally during 1930. This, of course, is not uniformly true of all business and all sections of the country. It is so generally the condition, however, that there should be no doubt or hesitancy; above all, no curtailment so far as public utilities are concerned.

Utilities are key businesses, affecting and affected by the general course of business. The central-station companies are committed to an expenditure of $865,000,000 for new construction during 1930, plus $125,000,000 for the maintenance of existing properties. This represents the normal provision for the care of the country's power needs, and because it does, contracts have been placed for much of the material and work. It may be said confidently that there is nothing in sight to warrant restriction of construction developments by utilities or to justify slackening of sales programs during the new year. Indications point the other way. The general determination of business to go ahead more aggressively than before the stock market crash is likely to call on the electric utilities for greater facilities and larger output in 1930 than had been anticipated.

Our industry's showing in 1929 has been excellent. There has been a gratifying growth in the energy output and in the number of new customers reached. The total production for the country registered an increase of 11 per cent. Industries used 12 per cent more energy last year than during 1928. Domestic use increased 15 per cent. There were 800,000 new domestic customers on the lines of the central-station companies by the end of the year and there was an increase of 8 per cent per customer during the year. Our business, in other words, is healthy and growing.

The increased business in the domestic field is particularly significant. It is here, as I have repeatedly pointed out, that the industry's statistics showed a need for aggressive sales effort for two reasons. It is a particularly promising field for larger business which can be handled with little or no increased investment, and it is our privilege and duty as an agency of public service to make effective the economies and conveniences of electric service as widely and liberally as possible.

I have frequently alluded to the effect of promotional rate schedules in producing increased domestic load. It is interesting to observe in connection with the average increase of 8 per cent that the average domestic price is now 28 per cent below the pre-war level. Sales have unquestionably been stimulated by lower prices for service. It remains for the industry to keep its investment as low as possible and to operate as efficiently and economically as possible. These are quite largely engineering problems, and I am confident the loyal and highly skilled staffs which have produced the high technical standards and increased operating efficiency of our industry will be able to handle these matters sucessfully. As they do, the maintenance of satisfactory earnings, even on a basis of lower revenue for each kilowatt-hour, will not be difficult. We are in this respect in a situation no different from that of many great and financially sound businesses. A lower unit price is made up for by largely increased volume of sales.

Obtaining needed new capital is a financial problem of the industry. It has not been a pressing problem for several years. I can see no reason why it should be more pressing in the new year or succeeding years. Electric utilities have established themselves in the public confidence as sound growing concerns. Their security quotations have been deflated. That is not an unmixed

evil. Indeed, to my mind, it is not an evil at all. The evil was that utilities were deemed speculative to such a degree that a deflation in stock values became possible. I am sure there exists as much confidence in the electric companies and in the future of electric development as there ever was, and I believe financing is likely to be aided rather than made more difficult by a more proper relation between actual values of stocks measured by earnings and yield and the exchange quotations on them.

It has been said that market conditions have put an end to consolidations and groupings of utility properties. I don't believe any merger or holding company grouping of companies, contemplated on a proper economic basis of bettering service, more economical administration and operation and bettering market conditions, will be stopped. Those are the advantages sought, or which should be sought, in every merger of utility properties or consolidation of utility interests. If they are measurably obtainable, the consolidation is justifiable. It can be justified to the people who sit in judgment—the owners of securities and the customers—by mutual advantages obtained by them. No change which cannot so justify itself in operation is worth contemplating. In fact, such changes merely give point to the critics of the utilities who claim we are creating a power trust and seeking to aggrandize ourselves at the expense of the public.

The electric industry, as I see it, faces no problem it is not perfectly capable of solving with the firm determination to earn its profits on sound business principles and earn public confidence as a valuable public servant. In the future, as in the past, it must seek growth by supplying high-grade progressive service, sold at as low prices as are consistent with such quality. It must win public support by a frank, friendly attitude, maintaining policies and practices which can stand scrutiny and not suffer therefrom.

Utility Leaders Say—

Enlightened Rate Policy Most Encouraging Sign

By MARTIN J. INSULL
President Middle West Utilities Company

THE opinion of those identified with the public utility industries as to the business prospects of 1930 has been so plainly indicated by deeds that it is almost unnecessary to state it in words. These industries are completing their 1929 budgets and have made budgets providing for a normal expansion of their business in 1930, and are putting these programs into execution in a matter-of-fact way. *Business as usual* is with them a fact, not a slogan.

Current business thought and comment emanates largely from the great financial centers, and the fluctuations of financial activity are very much more violent than the more moderate changes which mark the course of trade.

Even in the grinding depressions of the past, such as those which occurred in 1873 and 1893, business has always functioned more normally than residents of financial centers have believed at the time.

The country at large was not in the stock market, although it is apparent that there was wider participation than in any previous incident of the kind. The wider investing public, to a large extent, own the securities they have purchased and look to them for income rather than appreciation. The "break" was spectacular, but by no means general in its effect. Nevertheless, the American economic structure has passed through a healthy experience, which has served the double purpose of a warning and a reassurance. The successful resistance of the impact of the stock market break is justification for a confidence greater than before in the fundamental strength of American business and finance.

The electric light and power industry, dealing in a commodity of primary importance to industry and the home, is feeling no slackening in the use of its service. On the contrary, it is going ahead as rapidly as before, expanding its service, which is far from saturation. It faces expansion of two kinds. It must extend the frontiers of its service; it must reach the farms as it has already reached the small communities with such marked social and economic results, and as it, of course, long ago reached the larger cities. It must, at the same time, intensify the use of its service in the territories which it is now serving, especially in the domestic field.

Probably the most encouraging indication of success in this effort is the enlightened rate policy now generally prevailing, which places price and consumption in a reciprocal relationship by which the cost per unit of service constantly diminishes as the use of the service increases.

The operating and financial records of the utility industries disclose such a degree of stability and such a constant expansion of American industry and trade that the industry has adjusted its structure and functions to that state of affairs, and its progress and success are proof that it has proceeded from sound premises. From the same premises it reaches the conclusion that 1930 will be a year of satisfactory business volume, and also of growth in some lines of business, if not all.

Commercial Men Have Chance to Prove Mettle

By PAUL A. SCHOELLKOPF
President Niagara Hudson Power Corporation

THE total output for the Niagara Hudson system in 1930 is estimated to show an increase of 13.4 per cent over that of 1929. Industrial output is expected to increase 13.6 per cent and domestic output 10.0 per cent. Sales and advertising efforts will be intensified and every available means to build up industrial, residential and commercial business will be employed.

Niagara Hudson has organized an industrial development bureau, with headquarters in Albany. This bureau, through national advertising and personal contact with manufacturing executives, will seek to bring new industries into New York State. We believe that this bureau, aside from its contribution to New York State's progress, will bring a considerable load to our lines.

Operating ratio is not a good index for the companies in this territory because it is affected more by the ratios of power purchased and power generated from steam, to hydro-electric power than it is by operating efficiency. There is a marked tendency toward better service that increases the capital expenditures and operating costs without increasing the revenue. This is particularly true of the outlying and sparsely settled territory, but it is also true in the most densely settled territory. For example, we have recently started a three-year program for entirely rebuilding the secondary distribution system in Buffalo, in order to afford the most reliable, up-to-date and satisfactory service possible.

The cost of service becomes greater and greater as perfection is approached, and one of the big problems of the industry is to decide where to draw the line between improving service and reducing rates. Provided that a fair return is being earned, perhaps a better measure of the results than operating ratio is the increase in kilowatt-hours sold.

We must realize that electric service, under the present condition of society, is a necessity of life. Our competition comes from other industries supplying necessities.

Of course, there will be an increase in the industry's sales in 1930. The extent of that increase will be determined by the extent to which the separate companies comprising the electrical industry apply constructive, aggressive, intelligent salesmanship to their work. Our job in the last few years has become more and more a selling job. In 1930 more than ever before, our commercial executives will have an opportunity to show their mettle.

Political circles are giving the industry close attention. The questions of regulation and waterpower development are being discussed at great length.

The industry has every right to present the facts in regard to these important questions. It will continue to present these facts and to back them up with good service at reasonable rates.

The public, in possession of these facts and enjoying good service at reasonable rates, will not be lured on by theorists.

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WHAT INCREASE in industrial and domestic business is expected in 1930 by electric light and power utilities?

What steps are being taken to reduce operating ratio?

What may be done to improve economic influences?

These are three topics on which some utility leaders have expressed their opinion as applied to their own properties.

Budget Control Major Factor in Reducing Operating Ratio

By W. E. MITCHELL
Vice-President and General Manager Georgia Power Company

WHILE our operating budgets for 1930 were made up before the recession in the stock market during late October and early November, we do not believe that its effect will be great enough to necessitate reducing our forecasts.

Our total sales are expected to increase 14½ per cent in 1930 over 1929. This is made up of an increase of 15½ per cent in our industrial sales and 12 per cent in our detail and domestic sales. We will continue the same merchandise sales policies that we have followed during the last few years and expect to sell approximately $3,000,000 worth of appliances in connection with our load building campaigns.

For several years we have operated on the budget system, which we believe is very helpful in reducing expenses and searching out wasteful or careless operation. Each year our bogies are more carefully determined in the light of greater experience and this keeps our operating staff very alert on their jobs. In 1930 special attention will be given to reducing departmental and general expenses. In public utility work, I think this is the hardest factor to control and requires constant watching. We believe that careful attention to these points will materially assist us in improving our operating ratio.

In 1929 our divisional form of organization was completed, dividing the approximately 30,000 square miles which we serve in the State of Georgia into four divisions with a manager in charge of each, responsible for everything in his division. This practice, we expect, will improve our public relations and also result in operating economies.

Certainly the apparently growing tendency toward federal regulation and its stepping over into the provinces of our State Public Service Commission is a factor of great importance. The popular idea that seems to be prevalent, that there is no limit to which rate reductions may be carried, is another tendency that should give food for anxious thought to public utility executives, particularly since utility companies are also being pressed to extend the advantages of electric service into thinner and thinner territory.

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Satisfactory Rate of Increase Expected

By THOMAS N. McCARTER
President Public Service Electric & Gas Corporation of New Jersey

I SEE no reason to doubt that this company's increase in both the domestic and industrial output during 1930 will be at a satisfactory rate. Percentage increases in output in past years have varied from various causes and the business of central stations has not yet become, and it is questionable if it will become, sufficiently stabilized to permit of accurate forecasts of percentage increases.

This company will spend for new construction some $30,000,000. Much of this expenditure is for the purpose of improvements to plant and equipment. The additional efficiency in operation produced by these betterments, as well as increased use of present plant and equipment, affects the company's operating ratio favorably. That ratio is, however, already low and it is doubtful if it can be further materially reduced during 1930.

While "national political and economic influences" indirectly affect this company, as they do every other business concern, I know of none which are directly affecting its "load growth and public relations," and accordingly I have no suggestions for "improving unfavorable national conditions."

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Inertia in Developing Business Cause of Rate Attacks

By T. O. KENNEDY
Vice-President and General Manager Ohio Public Service Company

CONSIDERATION of the increase in sales from year to year should take into account saturation as to population or kilowatt-hour sales per capita. Our company serves a territory in north central Ohio having a population of 297,500 and our customers number 81,527, or one for each 3.6 persons. Our annual sales, eliminating power supplied to interurban railroads and other utilities, amount to 1,850 kw.-hr. per capita. Domestic sales average 570 kw.-hr. per customer per year.

Increases in kilowatt-hour sales, actual and estimated, for various classes are shown in the accompanying table:

	Increase 1929 Over 1928 Per Cent	Estimated Increase 1930 Over 1929 Per Cent
Domestic	11.0	11.1
Commercial metered.	11.4	5.5
Commercial flat rate (signs and display)	11.4	11.0
Power	11.0	5.0

During 1930 we plan to continue active efforts to build up our domestic load through the sale of improved lighting equipment, electric refrigerators, radios and ranges. The service charge form of rate which we have had in effect since 1922 is a constant encouragement to our customers to make fuller use of electricity in the low-priced block.

Our commercial customers appreciate the value of better lighting in their stores and windows and the advertising value of electric signs and display lighting.

We will promote the greater use of electricity for industrial heating processes by our power customers.

Operating efficiency will be improved through the concentration of power generation in our larger and more modern stations. This is made possible by the completion of a 132-kv. transmission system covering our entire territory and interconnecting with the systems of four neighboring companies. More efficient equipment has been installed in the

boiler rooms of two of our plants during recent months.

The political attacks which have been made during the past year upon the electric light and power industry have tended to create the idea in the minds of the general public that rates for electric service are too high. This naturally handicaps our company, along with all others, in our efforts to sell more service to present customers. This is unfortunate because it is upon the success of these efforts that lower unit rates depend.

As a matter of fact, the average domestic customer pays less than 10 cents per day for electric service, and instead of attempting to force the average monthly bill down to the irreducible minimum, those who have the real interests of the customer at heart should encourage the greater use of electric service at rates of the proper type under which the minimum user pays the full cost of his service and the larger user is permitted to purchase additional current at low unit prices.

In my opinion, our industry itself is largely to blame for the situation now existing because of the failure to appreciate the necessity of commercial activity for new-business development. The belated recognition now being given to the importance of promotional rates and the sale of energy-consuming equipment to customers will prove most effective in insuring the continued prosperity

of the industry providing a large majority of the companies undertake the program in an earnest and efficient manner.

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Ten per Cent Increase Chiefly from Homes

By R. F. PACK
Vice-President and General Manager
Northern States Power Company

A CONTINUANCE of sound and prosperous business conditions in 1930 is anticipated by the Northern States Power Company. Operating as it does in the central northwestern states, it is dependent in a large degree on agriculture. The conditions of the farmer are rapidly improving due in part to favorable legislation recently enacted and due to diversification and more efficiency in their farming operations.

The kilowatt-hour output for 1930 is expected to increase approximately 10 per cent, including about 7 per cent for industrial purposes and 11 for domestic.

Intensive activities for new business will be continued, particularly stressing the sale of appliances by ourselves and others for domestic use. Successful efforts are also under way to improve window lighting and factory illumination, as well as street lighting. Our sales department is exploring every possible avenue to increase our sales under every classification.

No special plans have been made to reduce further our operating ratio except to the extent that our operating department continuously bears this in mind. For the past several years our operating ratio has shown a satisfactory downward tendency. This, however, is affected by water conditions. Public relations in the territory served by this company are uniformly good.

Substantial rate reductions, aggregating $1,250,000 have recently been made effective throughout our territory. These followed reductions within the past two years of upwards of $1,000,000. The reductions have been very favorably received by our customers and the public generally and we anticipate no local or state influences which will minimize our present satisfactory conditions.

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6% Sales Increase Expected in Automobile Center

By A. C. MARSHALL
Vice-President and General Manager
Detroit Edison Company

NEXT year's business, according to our estimates, will show an increase of 6 per cent in electric sales for 1930 over 1929, with an increase in total output of 5 7/10 per cent. This 6 per cent increase in sales is made up of a 13 per cent increase in residence lighting, 11 per cent increase in commercial lighting, 3½ per cent increase in primary or wholesale power sales, 6⅝ per cent in commercial power sales and a 5 per cent increase in sales to other public utilities.

This moderate increase in gross earnings will require a close scrutiny of operating expense in order to maintain our operating ratio at a satisfactory point. We are *not* planning any drastic lay-off of operating employees, but a proposal to add to the payroll will be viewed with suspicion and vetoed unless a real need is shown. This may automatically result in the elimination or postponement of some departmental activities which we can well get along without, at least for a limited period.

We are *not* cutting our construction budget for 1930. We estimate these expenditures at $27,000,000, which represents about normal requirements. We believe it will be a good year for construction work, with reasonable equipment costs and a willingness on the part of labor to give a good day's work for a day's wage, which wage we hope will not be reduced from present levels.

Assuming the continuance of a reasonable cost of money, liberal construction expenditures will not only be justified but will be the best means of improving general business conditions.

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Credit and Wages Foretell Good Year

By F. R. PHILLIPS
President Duquesne Light Company

WE APPROACH the new year with confidence and with the expectation that while the first few months may not prove encouraging, when compared with the corresponding months of last year, we believe that the year 1930 as a whole will hold its own with other years with the steady onward progress of the electrical industry. Therefore, we are looking forward to approximately the same increase in sales for 1930 that has been experienced in the past two or three years, namely, a total of 9 per cent, domestic approximately 11 per cent and industrial approximately 12½ per cent.

Very substantial reductions have been made in our operating ratio within the past few years. We expect to

maintain that position throughout the coming year.

The absence of constructive legislation, with particular reference to the tariff, no doubt has had a depressing effect upon business generally. Whatever lack of confidence in our business structure created by recent market disturbances has largely been dissipated by the timely and effective action of President Hoover.

The foundations of our economic structure are sound and undisturbed, credit is available at reasonable rates, wages are at a high level and the purchasing power was never better. Surely, with these potent forces free to operate, prosperity will continue.

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Recent Rate Reductions to Stimulate Business

By R. H. BALLARD
President Southern California Edison Company

EXPECTED total increase of kilowatt-hour sales for 1930 over sales for 1929 is 13 per cent, that for domestic service, including domestic cooking and heating, being 21 per cent, all other, including wholesale, being 12 per cent. The resulting increase in gross revenue is estimated at 10 per cent.

This company's recent substantial decrease in electric rates accounts for a somewhat smaller expected increase in gross revenue than in kilowatt-hour sales. On the other hand, an appreciable part of the kilowatt-hour increases are arrived at after taking into account the stimulation to business that these rate decreases will produce during the coming year.

Customary methods for securing business increases will be continued. These involve the use of carefully prepared business surveys of its territory; disclosure of opportunities for supplying services by electrical means that may

now be otherwise handled; recurring campaigns, with district quotas, for connection of particular appliances such as electric ranges and water heaters; advertising—both specific and "good will."

All operations are administered under an operating budget, for the purpose of controlling those operating expenses which are controllable. Taxes and cost of fuel are considered non-controllable. The operating budget system has produced a steadily decreasing ratio of controllable operating expenses and it is expected that this ratio will continue to decline. The operating budget is prepared after detailed study of operating expenses of each department and its subdivisions. The targets are set high, but not so high as to be impossible of achievement. The plan is believed to bring about the keenest cooperation for reduction of expenses on the part of every company employee whose routine work may affect such expenses.

No national political or economic influences are known by us that very definitely affect the load growth or public relations of this company. Obviously, the economic situation of the country affects the numbers of people who come to add to the population of southern California, and also affects in substantial degree the prosperity of southern California's industrial enterprises. Sales of local manufacturing enterprises, however, are far more directly dependent upon business conditions on the Pacific Coast than upon the national situation. History has recorded several periods during which southern California increased its business activity at times when business east of the Rockies was relatively less active.

So far as means for improving unfavorable national conditions is concerned, it appears to us that the administration under President Hoover has already taken steps, not indeed to improve unfavorable conditions, but to insure that unfavorable conditions will not develop. Since we believe in the maxim that prevention is better than cure, we are heartily in accord with the action that followed the President's far-seeing vision.

SALES NOT ADEQUATE. Little doubt exists that the problem of sales and sales organization must be solved before great advances will be had in business for all branches of the industry. Intensive efforts at selling, utilizing the present industry organization, will produce results, but at an excessive cost and in a cumbersome manner.

Each branch of the industry plays too much of a lone hand and each sales outlet uses wasteful and unintelligent sales methods. It is high time the utility, the manufacturer, the jobber and the contractor-dealer found a team-play program whereby each has an adequate and economical slice of the market and each helps create desire in the minds of customers.

Prosperity Funds of 1929 for 1930 Spending

By CLARENCE L. COLLENS

President National Electrical Manufacturers' Association

THE electrical manufacturing industry has just completed one of the most prosperous years in its history. In many of its branches high levels have been attained which are above what might be considered the normal trend and in practically all branches the levels reached are above those of 1928.

A careful survey of productive activity for the months of September, October and November showed a 14 per cent increase over that of the corresponding period in 1928. Inventories as a whole are no greater than a year ago and represent a healthy condition in relation to the increased volume of business done. The anticipation for the first six months of 1930, except possibly in radio, is a return to normal activity, but at levels which will be in step with the steady continued growth of all industrial activity in this country.

It must be recognized that the electrical manufacturing industry merely reflects the situation in other industries and that our prosperity depends very largely on the programs for plant extensions and development work which are initiated in other industries. In the appliance, radio and refrigeration fields it is also dependent on consumer-purchasing power.

In respect to electrical apparatus and supplies entering the industrial field, a recession from the peak of 1929 can be expected, but the year as a whole should be a good normal year, about half way between the levels of 1928 and 1929. In respect to the larger types of apparatus entering the central-station field, with the announced programs of the public utilities, a continuance of the good business of 1929 should be realized. In the electrification of the railroads, certain major projects were put through in 1929 and other major projects will be reflected more in the business of 1931 and will merely be in preliminary stages during 1930.

Due to inability to finance at reasonable rates of interest, the construction industry has been below normal. The ability to finance is now corrected and the program initiated by President Hoover, contemplating full co-operation between governmental, financial and construction interests in stimulating a real construction program for the year 1930, should result in business improvement in such electrical products as enter the construction field.

A significant fact in connection with a recent survey made is that the executives, close to the business situation in the appliance field, anticipate a slight improvement during the first six months of 1930, indicating, in the judgment of these executives, a continuance of consumer-purchasing power.

Fundamental conditions are sound. There has been speculation in stocks, but no speculation in industry such as that which attended previous bull markets. Stock prices have been deflated to normal investment values, but no similar deflation in industry will be necessary. There has been no speculation in inventories and prices have remained at normal levels.

Our program for the year 1930 should be directed toward (1) the maintenance of normal activity, (2) self-regulation, (3) the extension of all research investigations and (4) the modernization of industry.

Research should not be limited to the scientific investigation of materials and the development of new products, machines and methods, but should extend into the realm of the facts and economics of the electrical manufactur-

ing industry, more accurate information regarding the current business situation, its trends and inventories, and some investigation of the costs and channels of distribution. The electrical manufacturing industry does not compare favorably with many other industries in having adequate facts available for planning policies.

Self-restraint and mutual confidence

Progress can be made in correcting commercial and economic ills. There are some branches of the industry where the competitive situation is not healthy and where improvements can be effected, recognizing fully all legal limitations of co-operative effort. In many cases proper codes of business conduct are necessary and are just as much in the interests of the purchasing public as of the competitive groups. Self-regulation is desirable, but the keynote to self-regulation in any group is *self-restraint* and *mutual confidence*.

The year 1930, with its return to more normal conditions, backed up by the funds available from the prosperity of 1929, affords a real opportunity for effective work in the modernization of industry. This goes beyond the scope of repairs, replacements and betterments, and in any program which contemplates modernization the electrical industry has an important part to play.

There are still too many obsolete, inefficient machines and methods in all industries. Not only can the electrical manufacturing industry set its own house in order, but it can also do constructive educational work in other industries. This means the extension of modern industrial lighting, greater use of electric heat and electric welding in manufacturing processes, and the introduction of modern efficient machinery properly motorized to give improved quality and lower costs.

The maintenance of high wage levels, coupled with a continued progressive reduction of the labor element in costs, by means of improved machinery and improved methods, has been a major factor in our prosperity of recent years. Accelerated effort in the modernization of all industry during the year 1930 will not only assist in stabilizing business conditions during that year but will lay an important foundation for future prosperity.

I am an optimist regarding the future of the electrical manufacturing industry and believe that during the year 1930 normal steady progress will be made in all its branches. However, the fundamental slogan behind all efforts should be that announced by President Hoover at the Washington conference—*work*.

1930 Business Will Be—

Business Stabilization Will Minimize Recession

By A. W. ROBERTSON
Chairman Westinghouse Electric & Manufacturing Company

THE year 1929 brought the electrical manufacturing industry the largest volume of business that it has ever enjoyed. The sales of the larger electrical manufacturing companies showed an increase of about 30 per cent over those of 1928, which was itself a record-breaking year, and many smaller manufacturers did even better. Earnings also increased as the result of manufacturing improvements introduced during the past few years.

During 1930 there will probably be a falling off in the demand for certain lines, as the effect of the recent fall in security values will undoubtedly be felt to some extent. But on the other hand, the general economic situation is thoroughly sound and the movement to stabilize business, being carried out by American industries under the leadership of President Hoover, will probably tend to prevent any great recession, especially for the electrical manufacturing industry, because the use of electricity is now so general that this industry benefits by constructive activity in almost every field.

Not only is the use of electricity growing normally everywhere, but a marked increase in the demand is anticipated in certain fields. A number of railroads are planning electrification on a large scale, and it is probable that much of their power requirements will be supplied by central station systems. How rapidly electrification will be extended will depend largely upon the needs of the public, but judging from the past, it is quite likely that within the next decade or so, much of the railroad mileage in the area bounded by Boston, Buffalo, Pittsburgh, and Washington will be electrically operated.

Partial electrification of industrial plants is now being superseded by complete electrification, which permits the use of continuous processes and higher speeds, thereby reducing unit costs. If business were to fall off in 1930, it is believed that many industries will take the opportunity to rehabilitate their plants along these lines.

The public has finally realized the value and relative cheapness of electricity as a comfort-making medium, so that the use of electricity in the home is showing a marked increase. The sales in 1930 will undoubtedly be larger than in 1929.

Rural electrification is now an accomplished fact, and since the use of electrical apparatus reduces the cost of the production for the farmer, the possibilities of expansion in this field are very large.

Expects Business to Equal Last Year's

By ALBERT L. SALT
Chairman Graybar Electric Company, Inc.

WHILE we do not expect any increase in business next year, in either the industrial field or the central-station field, I honestly believe that next year's business in these fields will be as good as it has been this year.

Up to the present time we have not experienced any changes in the purchasing policy of our customers, due to mergers, but I believe that there may be changes in the future due to mergers.

The electrical industry can do little to stimulate the market industrially because the leaders of the power and light companies are thoroughly posted on the work ahead of them. This was forcefully brought to our attention at the Hoover conference when it was outlined that they would spend next year between a billion and a half and two billions of dollars.

As far as homes are concerned, there is a lot to be done, and we are all, through advertising broadly in a nation-wide way in magazines, newspapers, radio and high man-powered sales work, working to have this business grow.

Within the past months the railroads and public utilities and other business groups have announced that they are contemplating even more activity in 1930 than in 1929. The business of the electrical distributor, therefore, should be increased. While he may find a decreased demand for his products in some quarters, he may expect a continuation of good business if the plans mentioned above are carried through.

In all quarters there is seen the tendency to let the wholesaler assume the distribution functions for which he is best fitted. The larger buying units, in particular, are depending more and more on distributors' stocks, thus liberating their capital and facilities for other purposes.

More than ever before, the electrical industry is facing severe competition for its share of the consumer's dollar. If any diminution in purchasing results from the decline in security values, it will mean a more determined effort on the part of every one who has anything to sell. Therefore, the electrical industry needs not only to maintain its present position but to exert every effort toward securing a greater share of the consumer's dollar.

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Mergers and Campaigns Will Increase Business

By GEORGE A. HUGHES
President Edison Electric Appliance Company, Inc.

WE ANTICIPATE a substantial increase in business next year in the industrial field to which we cater and in the household market through central-station channels.

The merger movement among central stations indicates more aggressive promotion of those appliances which have a substantial energy-consuming factor.

In order to stimulate the market, we believe that the entire electrical industry should work together in sales-promotion

campaigns, particularly the national campaign proposed by the industry sales conference.

Anticipates More Building and Electrical Construction

By LEO E. MAYER
President
Association of Electragists International

THE continued growing ease in money, following the recent drastic reaction from speculation, is placing real estate and building loans on a sound competitive basis for capital. This should result in a very marked stimulation of building activity during 1930, which, naturally, will add a welcome acceleration to the electrical construction industry. To this will be added the planned program of federal, state and municipal building projects of many millions in value, in line with President Hoover's program of continuous employment,

Modern illumination, ventilation, refrigeration, high-speed elevators and the flexible application of electrical power, wherever it is needed, through the modern methods of wiring commercial buildings, are perhaps the greatest incentive for business to continue the march of progress into the newest types of building units. This same modernization movement extends to apartment houses and hotels, and into the industrial plants, where the direct-drive motors and flexible application of electrical power to high-speed machines, effect economies of utmost importance in modern production.

In the business field of the electrical construction industry, perhaps the outstanding development is the movement for credit control. During recent years greater manufacturing production has resulted in increasing pressure being

applied to distributors to find a market for the material produced, resulting, in turn, in the distributors and wholesalers accepting, as outlets, types of retailers and electrical contractors without credit, who trust to luck, depending upon the diversion of funds from the next transaction, or other devices, in order that the inevitable day of reckoning may be avoided.

The Association of Electragists has been making broad studies of this evil and is working to correct it, through the urging upon the wholesalers of such a system of credit control that the public may be protected by an assurance that their work is being handled by financially sound electrical contractors, who will execute all of their contracts with fidelity.

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Plans on 10 per Cent Gain; Urges Teamwork

By R. J. RUSSELL
Vice-President Century Electric Company

THE volume of next year's business is very difficult to determine, but our opinion is so firm that we are planning for about 10 per cent increase

in the combined central-station field and industrial field in 1930.

Some changes in buying have been noticed on account of the mergers that have taken place which have cost us some business.

No suggestions for stimulating the market can be offered at this time except to keep pounding along the lines on which we have all been working the last year or two, with the expectation that better returns will be experienced as the result of cumulative effort along a given line.

▼

Railroad Electrification to Expand Markets

By GERARD SWOPE
President General Electric Company

PROGRESS in the electrical manufacturing industry during 1929 has been very satisfactory in every direction. A new record of sales was established, the increase over 1928 being approximately 34 per cent. There has been a very substantial increase in the use of electric current in the homes and in every field of human endeavor. It is remarkable how this increase continues from year to year.

Distinct progress has been made in the initiation of plans for the electrification of railroads and we look forward to still greater development in this direction in the near future. Developments in electric appliances are proceeding at a rapid rate and new uses are constantly being found for electricity, which constantly widens the field of the electrical manufacturer.

With this expansion and development in the industry, we look with confidence to a satisfactory business throughout 1930, with adequate earnings and steady employment for labor.

▼

Faith of Utility Leaders Insures Prosperity

By H. W. YOUNG
President Delta-Star Electric Company

THE greatest factor in the past development of the electrical business has been the faith of public utility executives in their business, and the budget announcements for next year are expressions of continued faith.

Manufacturers of electrical equipment

will sink or swim with the public utilities and their strongly expressed plan to swim through 1930 means that manufacturers with the ability to swim will finish next year in good condition. Progressive manufacturers are planning to maintain full speed ahead and keep up the pace public utility leaders have courageously set.

The basically sound, far-sighted manufacturer with his research departments and laboratories will sooner or later be

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MANUFACTURERS' EXPECTATIONS regarding business for 1930 are indicated by the accompanying comments of a few business leaders.

Anticipated business increases in industrial and utility fields, effects of mergers on buying habits, and methods of stimulating sales are some of the topics discussed.

finding new markets and additional buyers for his products.

To those manufacturers who do not yet realize their obligations to the industry by keeping up research and new developments to meet tomorrow's needs the only question is, "How soon will it be too late?"

The important work being done by N.E.M.A. in establishing standards of design and manufacture will have a marked influence in helping manufacturers to produce better equipment.

As to the future of the electrical industry, I am sanely optimistic for those manufacturers who do their part toward development and research work.

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Follow Through with Sales Effort and Advertising

By OTTO H. FALK

President
Allis-Chalmers Manufacturing Company

REGARDING the percentage increase in business anticipated in the industrial and central station fields for 1930, I would estimate that in both fields this would average about 10 per cent over 1929.

One of the important changes in buying habits brought about by the merger movement is in centralized purchasing. In the utility field, particularly, consolidations are leading to larger central stations more advantageously located

with improved economies and employing power units of much larger capacities.

Such organizations as the National Electric Light Association, the Society for Electrical Development and other groups, in their comprehensive studies for the industry, embracing heating and refrigeration, as well as power and lighting applications, are pointing the way for advancement, which, if followed with the proper emphasis in sales and advertising effort, is bound to react to the advantage of the entire electrical industry.

Looks to Industrial Field for Business

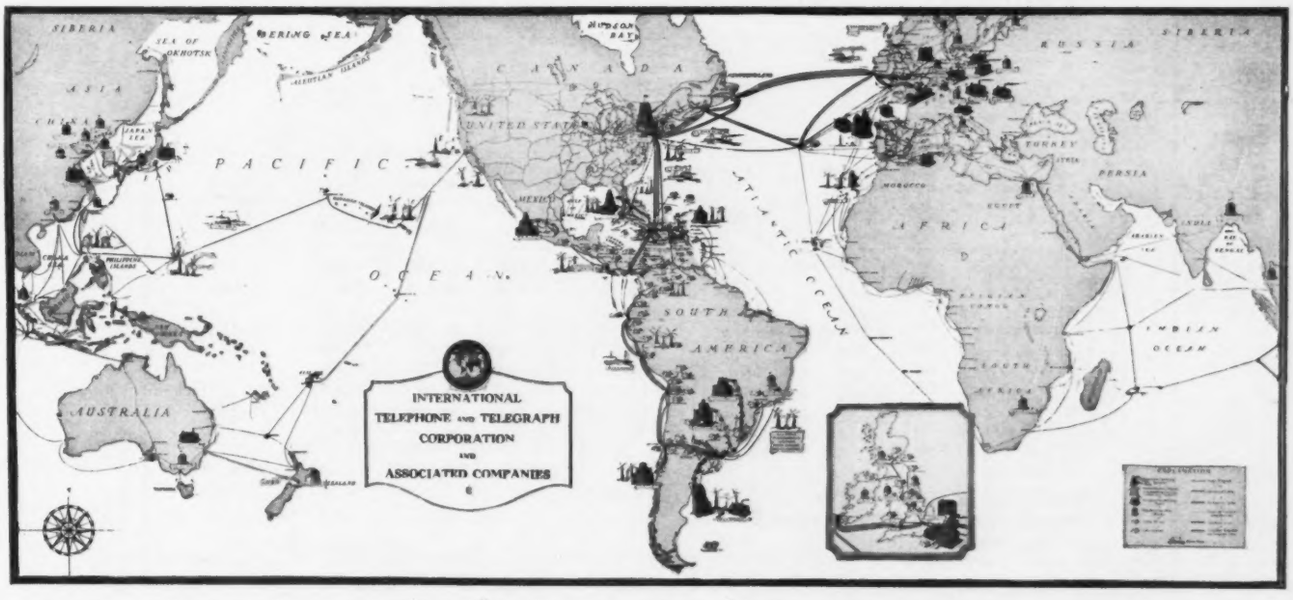
By B. L. WORDEN

President Cutler-Hammer, Inc.

THIS company is not interested in the central station field as a market. In connection with the industrial field our anticipation is that business will not

be quite so good in 1930 as it was in 1929. We do not notice any change in buying habits because of the merger movement.

World-Wide Communication Speeds Business



Central-Station Revenue

By G. F. WITTIG

Statistical Editor ELECTRICAL WORLD

THE year that marks the celebration of Light's Golden Jubilee marks also the attainment, by the industry founded on the use of the incandescent lamp, of an annual operating revenue for the first time surpassing two billion dollars. Amounting to $2,107,000,000, it exceeded the earnings for 1928, computed to be $1,941,955,000, by 8.5 per cent and overshot the revenue for 1927 as revealed by the recently published government census returns for that year by nearly $305,000,000. Operating expenses, $942,000,000, indicate an operating ratio better than 45 per cent.

Meanwhile the energy output rose to 92,737,000,000 kw.-hr., almost 10,000,000,000 kw.-hr. more than in the preceding year. If to this we add the output from other public utilities generating electrical energy, chiefly railways that produce their own power, the total comes to 97,703,000,000 kw.-hr. as the year's aggregate for all electrical public utility plants in the United States.

Central Station Revenue and Energy Output per Capita

Output includes electric railways and other utilities

Region	Revenue, Dollars	Output, Kw.-Hr.
United States	**17.50**	**815**
New England	21.90	820
Middle Atlantic	22.90	985
East North Central	20.00	935
West North Central	13.90	430
South Atlantic	12.30	740
East South Central	8.50	385
West South Central	10.30	415
Mountain	15.10	1,020
Pacific	29.50	1,780

Of the 24,257,159 customers more than four-fifths, 19,721,486, are residential, which means that 70 per cent of our homes now have electric service. The increase in this group during the year was 887,516. In addition the number of commercial lighting customers grew by 126,495 and of new users of central station energy for power and miscellaneous purposes by 58,367. In all, there were somewhat over a million more at the end than at the beginning of the year.

To perform this service called for the use of 29,550,000 kw. of plant capacity and involved an investment of $11,100,000,000. Aside from the output of hydro-electric plants, which constituted 36.4 per cent of the total, there was required for the generating of the central-station electrical energy a consumption of 41,794,000 tons of coal, 9,477,000 bbl. of fuel oil and 112,672,000,000 cu.ft. of natural gas.

In general the movements evident at the beginning

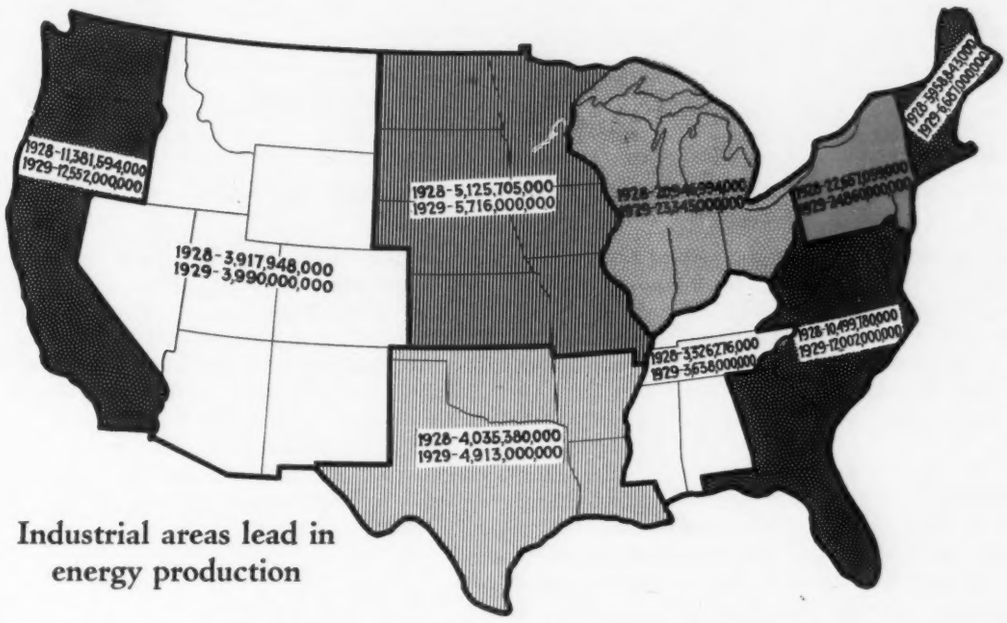
TABLE I—DISTRIBUTION OF CENTRAL STATION ENERGY, 1921 TO 1929

(100 per cent of the industry)

Year	Energy Generated* (Millions of Kw.-Hr.)	Net Energy Imported‡ (Millions of Kw.-Hr.)	Total Energy Generated and Imported (Millions of Kw.-Hr.)	Estimated Net Consumption by Ultimate Users (Millions of Kw.-Hr.)				Line Losses and Intra-Company Business (Millions of Kw.-Hr.)
				Total	Lighting	Power	Railways	
1921	36,971	1,020	37,991	30,700	8,700	17,400	4,600	7,291
1922	43,560	862	44,422	35,822	9,560	20,620	5,642	8,600
1923	51,133	1,055	52,188	42,220	11,410	25,110	5,700	9,968
1924	54,413	1,400	55,813	45,000	12,990	26,210	5,800	10,813
1925	61,159	1,239	62,398	50,221	13,790	30,631	5,800	12,177
1926	69,158	1,506	70,664	56,964	15,000	35,964	6,000	13,700
1927	75,781	1,632	77,413	63,293	16,200	40,985	6,108	14,120
1928	82,927	1,587	84,514	69,056	17,916	44,390	6,750	15,559
1929†	92,737	1,600	94,337	77,537	20,400	50,337	6,800	16,800

*1921-1928 as collected by U. S. Geological Survey.
†Based on ten months' operation.
‡From Canada Year Book.

Passes Two-Billion-Dollar Mark



Industrial areas lead in energy production

of the year have continued. The energy output leaped up by 12 per cent over that of 1928. Each month showed an advance over the corresponding one of that year; once it rose to 17 per cent. In this respect the record has been consistent with that of the past. Only in a single year since annual statistics have been collected was there a decrease. That was in 1921.

Revenue has risen correspondingly, though in smaller ratio, 8 per cent, as a result of two influences. One of them is the gradually decreasing average residential rate, and, probably to a less extent, in the rate for large power. The other is the relatively more rapid growth of wholesale energy sales, which constitute an ever larger portion of the total output.

The number of systems continues to shrink, because of consolidations. There was a time when the providing of service in additional towns necessitated the organizing of new companies. That day has long passed. For a number of years not an incorporated town of 2,500 people, or larger, has been without electric service. No statistics are available for smaller places, but it can safely be asserted that the communities containing as many as 500 people which still lack distribution systems must be few indeed.

The dwindling number of villages and hamlets, as yet unserved, are being reached by transmission lines rather than by the starting of local plants, though there are exceptions. Small, isolated places, too remote to justify

TABLE II—SOURCES OF CENTRAL STATION REVENUE, 1921-1929

(100 per cent of the industry)

Year	Total Gross Income for Electric Service	Estimated Allocation of Revenue			
		Received from Lighting Customers	Received from Power Customers	Received from Electric Railways	Received from Other Public Utilities
1921	$944,400,000	$570,800,000	$267,800,000	$44,650,000	$61,450,000
1922	1,072,119,883*	657,119,883	303,200,000	50,750,000	61,050,000
1923	1,269,550,000	795,000,000	358,150,000	52,200,000	64,200,000
1924	1,354,520,000	902,670,000	321,000,000	54,400,000	76,500,000
1925	1,480,500,000	979,500,000	367,540,000	53,270,000	80,190,000
1926	1,652,300,000	1,018,200,000	461,000,000	58,100,000	115,000,000
1927	1,802,655,000*	1,030,500,000	572,345,000	64,200,000	135,610,000
1928	1,941,955,000	1,116,401,000	622,315,000	63,700,000	139,539,000
1929	2,107,000,000	1,216,000,000	681,000,000	64,000,000	146,000,000

*From U. S. Census

Energy Generated by Central Stations

(Millions of Kw.-Hr.)

	United States	New England	Atlantic	North Central	South Central	Mountain-Pacific
1907.....	5,862	474	2,276	1,462	257	1,393
1912.....	11,569	865	4,278	3,241	462	2,723
1917.....	25,438	1,835	9,405	7,534	1,531	5,133
1922.....	40,291	2,970	14,555	12,337	2,461	7,968
1927.....	74,686	4,750	27,727	22,761	6,052	13,396
1928.....	82,927	5,350	30,396	25,353	7,083	14,745
1929.....	92,737	6,075	34,008	28,386	8,241	16,027

Gross Revenue of the Central Stations

(Millions of Dollars)

	United States	New England	Atlantic	North Central	South Central	Mountain-Pacific
1907.....	169.6	18.1	62.9	49.3	11.8	27.5
1912.....	287.2	28.5	103.4	90.9	19.7	44.7
1917.....	502.1	52.5	179.8	165.6	32.7	71.5
1922.....	1,020.4	100.9	365.5	342.9	74.1	137.0
1927.....	1,802.7	156.8	669.6	585.9	164.9	225.5
1928.....	1,941.9	170.0	733.6	611.4	178.4	248.5
1929.....	2,107.0	181.3	773.5	683.1	202.5	266.6

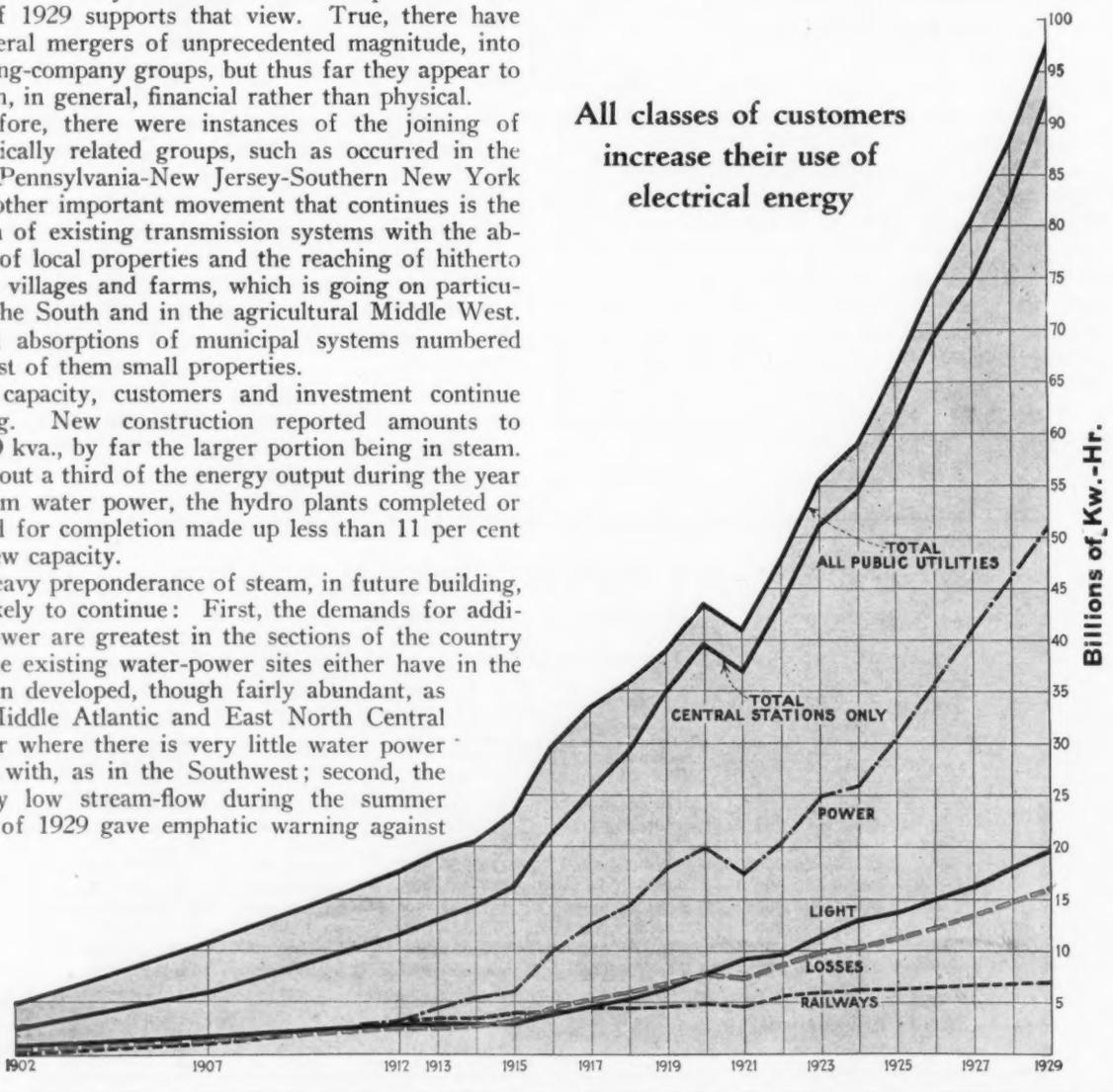
the immediate extension to them of existing power systems, have put up internal combustion engine plants. There are probably more of these than the records show; to secure complete information is, practically speaking, impossible and not worth the effort, for they constitute only a negligible fraction of the industry. In fact, to include them in any count would be more misleading than otherwise.

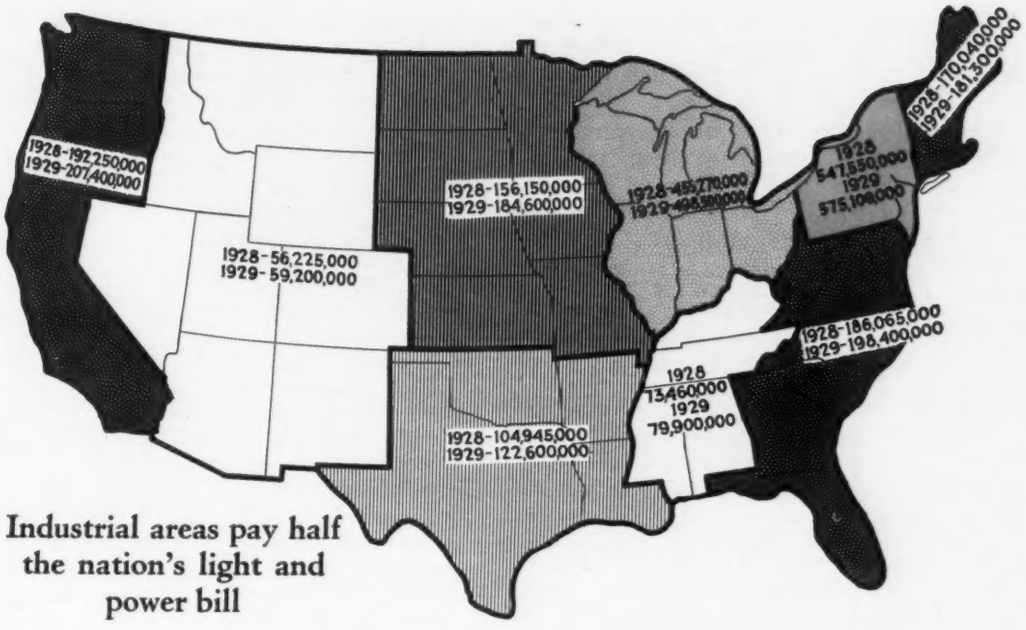
A year ago the statement was made that much of the work of consolidating adjacent properties and welding them into unified systems had been accomplished. The record of 1929 supports that view. True, there have been several mergers of unprecedented magnitude, into the holding-company groups, but thus far they appear to have been, in general, financial rather than physical.

As before, there were instances of the joining of geographically related groups, such as occurred in the Eastern Pennsylvania-New Jersey-Southern New York area; another important movement that continues is the extension of existing transmission systems with the absorption of local properties and the reaching of hitherto unserved villages and farms, which is going on particularly in the South and in the agricultural Middle West. Reported absorptions of municipal systems numbered 149—most of them small properties.

Plant capacity, customers and investment continue increasing. New construction reported amounts to 3,031,510 kva., by far the larger portion being in steam. While about a third of the energy output during the year came from water power, the hydro plants completed or scheduled for completion made up less than 11 per cent of the new capacity.

The heavy preponderance of steam, in future building, seems likely to continue: First, the demands for additional power are greatest in the sections of the country where the existing water-power sites either have in the main been developed, though fairly abundant, as in the Middle Atlantic and East North Central States, or where there is very little water power to begin with, as in the Southwest; second, the extremely low stream-flow during the summer and fall of 1929 gave emphatic warning against the danger inherent in a lack of abundant steam-power reserve. Two important cities dependent solely on municipal water-power plants suffered a "power famine" resulting in a call on the national government for the temporary use of a naval vessel to serve as a traveling power plant. Private systems in other parts of the country were obliged to increase greatly the output of their steam plants or to import energy from neighboring systems to meet the deficiency in hydro power. In September the output of fuel-burning plants





Industrial areas pay half the nation's light and power bill

was 24 per cent greater than it was a year before. It is not surprising to find, as a result, a marked increase in the budget for steam plants to be built in 1930, while the outlay for water power will be rather smaller than last year.

Other features of the estimated construction budget indicate greater allotments to transmission, signifying further extensions and interconnections, while a huge slice of the total, more than 40 per cent, goes into distribution systems, presumably reflecting important and costly reconstruction, such as the putting of lines underground and extension of rural service, rather than an expected large increase in services to urban customers, for the number of the latter shows no prospect of any sudden and large augmentation.

The recital of a mass of statistics on a basic industry in a great country merely gives an impression of vast magnitudes, millions and billions. But the business of supplying the people of the United States with electrical energy for light and power has been a big industry for many years. Comparisons are necessary to bring out the changes occurring with the passage of time.

First, as to the commodity produced. Central stations exist for furnishing a cheap and convenient form of energy, an essential to manufacturing industry, virtually a necessity in every household except those in the most sparsely inhabited regions. In the seven years since the census of 1922 the output has considerably more than doubled. The increase in a single year now approaches the total production in 1912 and would probably be found to exceed that of 1910 if the data were available.

The most striking gain has been in the sale of energy for industrial power, two and a half times as great now as in 1922; 47 per cent of the total production then; 53 per cent at present. American manufacturers are adding to the electrical horsepower operated on purchased energy at the rate of 1,000,000 hp. annually. The process has been going on quite uniformly for a decade. There is as yet no evidence of a retardation in pace. Presumably there is an upper limit, but it does not call for concern at this time. That steady growth is significant for the future, both of our manufacturing and of the light and power industry. It is in harmony with the trend of the times. The same sort of thing is happening abroad. Aside from motorization, there is the gradual increase, with a huge potential market, in the industrial use of electric heating and electrometallurgical processes, on which no accurate statistics are yet at hand.

The next great market lies in electric lighting and in other domestic uses of power. This, too, has doubled, and while the gain in number of residential users tends to slacken, as the unwired homes become fewer and fewer, the latter change is balanced by greater consumption per customer. Ranges, water heaters and oil burners hold promise of vast future gains. The rise in average sales annually per residential customer from 447 kw.-hr. in 1925 to 507 kw.-hr. in 1928, as found in the

Operating and Maintenance Expenses of Central Stations

(Millions of Dollars)

Including Taxes, interest on funded and floating debt, depreciation and sinking fund

	United States	New England	Atlantic	North Central	South Central	Mountain-Pacific
1907.....	**134.2**	12.6	49.7	39.8	9.5	22.6
1912.....	**234.6**	21.4	84.1	76.4	15.0	37.7
1917.....	**426.6**	42.0	153.4	144.6	27.6	59.0
1922.....	**859.6**	83.0	309.0	296.4	58.8	112.4
1927.....	**1,318.3**	.....	.....	.....	.....	.....

Exclusive of taxes, interest on debt, depreciation and sinking fund

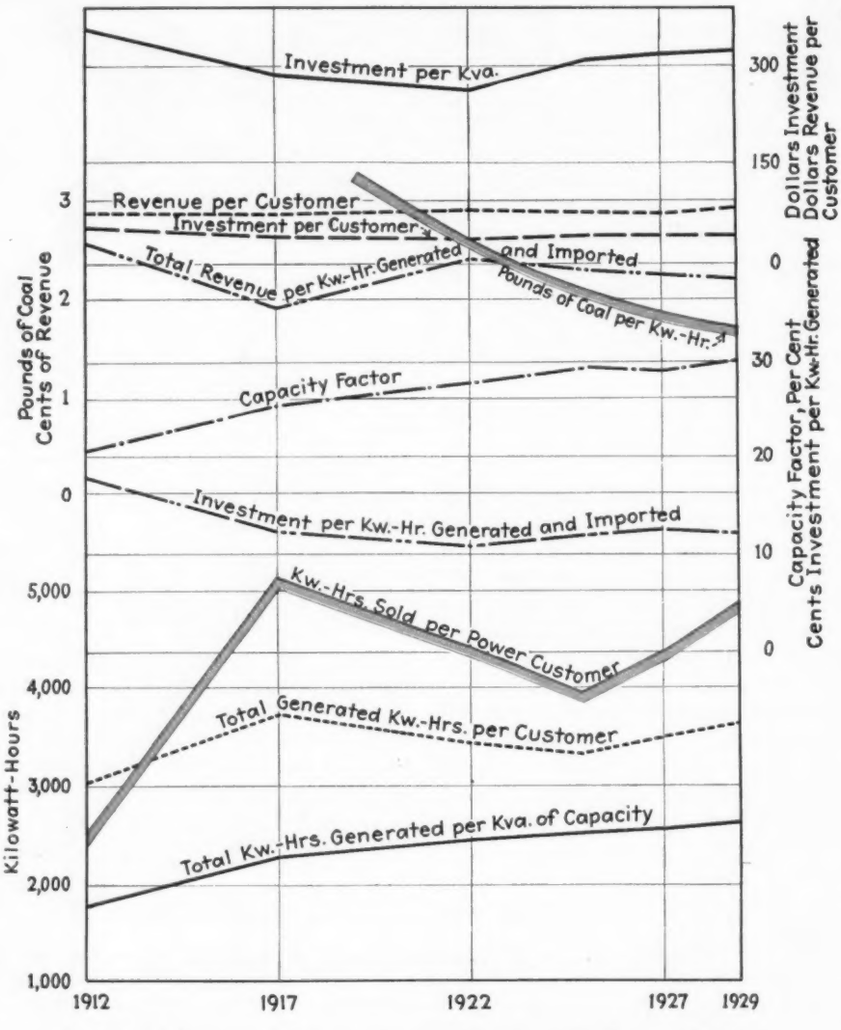
1917.....	**284.8**	29.7	107.8	99.6	17.6	30.1
1922.....	**553.0**	57.7	202.7	197.0	39.1	56.5
1927.....	**828.2**	71.2	308.2	282.9	85.8	80.1
1928.....	**866.3**	75.6	327.3	280.8	91.4	91.2
1929.....	**942.0**	80.3	343.0	318.0	103.7	97.0

record of 41 large companies, is only an example of what is going on everywhere. But compared with industrial power, energy for lighting, once the chief use of electricity, has fallen far behind.

While the revenue has doubled in seven years the average returns per kw.-hr. sold have been falling, especially in lighting. Since 1922 the average receipts for the latter, including commercial lighting, dropped from 6.9 cents to 5.9 cents per kilowatt-hour. The census of 1922 did not segregate residential service, but in 1927 the average was 6.75 cents; at present it is about 6.5 cents.

Lighting is still the source of the larger part of the revenue, but is falling in relative importance. As the small consumer's hours of use of plant increase —station, substation and lines— he is entitled to a reduction in average price. Present-day rate structures generally embody that principle. Statistics show that, taking the country at large, he is getting it.

Evidence that the power companies are sharing their economies with the consumer is found in the circumstance that the operating ratio is decreasing but slowly. In 1922 it stood at 52 per cent, if the non-operating revenue is omitted from consideration. The decrease has averaged 1 per cent annually since that time.



Unit factors show constant progress by utilities

A further influence against rapid decrease in operating ratio lies in the growing sale of energy for resale, evident in the rising revenue from that source. In the comprehensive totals for the country this sum, $146,000,000, stands on both sides of the account, and thus increases the ratio. This by no means implies that the transactions were disadvantageous. Energy is in general interchanged or purchased only when it is mutually profitable to do so.

However, if all systems in the United States could be imagined to constitute a single business organization the cost of energy transferred would be simply an interdepartmental charge, vanishing from the total. By a mere change in accounting, then, the operating ratio would fall to 40 per cent.

The industries of the whole electrical group are intimately dependent for their prosperity on the soundness of all other industries, and in turn by cheapening production and improving quality electrical methods contribute to the well-being of those other industries. The two cannot be separated. They are economically parts of a country-wide and increasingly of a world-wide whole.

Increasing motorization, more energy use for electrothermal, electrochemical and electrometallurgical operations, better industrial lighting — those are the paths along which the electric power industry has been traveling in promoting our industrial advancement.

In the home many applications now in only occasional use may be expected to repeat the history of the incandescent lamp and to become more and more common. The effect will be the continued building up of a residential load of much greater magnitude in kilowatt-hours than we now have, and of much better distribution throughout the day.

Since both of these processes, the upbuilding of the industrial and of the residential load, are and long have been in progress, and since they are far from completed, energy sales must grow as they have grown in the past. Since the tearing of a leaf from the calendar will cause no sudden change in the habits of us all, the rate of growth must, with possible temporary and minor fluctuations, go on about as it has gone on heretofore.

By 1937 the output will probably have doubled, just as it doubled in the past seven years, though no man may have predicted in 1922 just where the new load would come from, to double the production by 1929. And to produce the 200,000,000,000 kw.-hr. of that future date will probably call for a doubling of the plant capacity, and all that goes with it, making it 60,000,000 kw.

Sales Increase 10 per Cent

Outlook for 1930 at least as good as in 1929
Trade practice agreements made
Marketing problem seriously attacked

ELECTRICAL manufacturers produced $2,695,000,000 worth of equipment and sold it to buyers during 1929, according to available statistics and estimates. This is a gain of 10 per cent over 1928 and is a record for the industry. The year witnessed a steady business for the entire period with a slight slackening during the last month. Indications are that the total volume of business for 1930 will equal that of 1929 and in some lines an increase is expected.

During 1929 practically all electrical products were sold in good volume and at fair profit margins and on the whole electrical manufacturers are in better financial condition than has existed at any time in the past. Several major developments have occurred during the year that promise to place manufacturing and distribution on a better plane.

One trend of noticeable value is the development of agreements as to good and bad trade practices. Several groups are attempting to do this through co-operation with the Federal Trade Commission, but other groups prefer to work independently. This movement is stimulating accurate cost accounting and the development of statistics, to say nothing of the growth of good faith and confidence. It is acting as a stabilizer to the industry.

A second trend of importance is an intelligent approach to the marketing problem. Two large manufacturers have established national subsidiary jobbing chains and another independent jobbing chain has had a successful year. Many studies of marketing and selling have been made and the idea of selective selling instead of volume selling has been introduced. There is little doubt that distribution will be improved greatly through the work now going on.

In a general sense there has developed more of a teamplay idea in manufacturing. More and more it is realized that the manufacturer, the utility, the jobber and the contractor and dealer have a common objective in developing electrical business. Definite steps are being taken to create desire in all markets and to sell all markets by a method and mechanism that uses all sales outlets economically and to the best advantage.

Sales of Major Electrical Apparatus

	1928	1929
Generators (including a.c. and d.c. power apparatus) and turbines	$40,000,000	$50,000,000
Power transformers (over 500 kva.)	19,000,000	36,000,000
Distribution transformers (under 500 kva.)	25,000,000	30,800,000
Motors	130,000,000	145,000,000
Switchgear and breakers	65,000,000	75,000,000
Industrial control apparatus	56,000,000	68,000,000
Traction apparatus	35,000,000	42,000,000
	$370,000,000	$446,800,000

Larger Program for 1930

During 1930 it is expected that large increases in business will be had in railroad electrification, in steam and

SALES AND EARNINGS OF SEVENTEEN ELECTRICAL MANUFACTURERS

	Gross Sales			Earned on Common		
	1926	1927	1928	1926	1927	1928
Allis-Chalmers Mfg. Co.	$30,682,543	$33,352,252	$36,294,562	$9.39	$10.02	$11.28
American Brown Boveri Elec. Corp [3]	896,024	578,944	1,187,017	.....	.....	.....
Century Electric Co. [2]	1,321,138	1,170,159	910,209	17.72	13.73	10.87
Crocker-Wheeler Mfg. Co. [2]	298,281	194,543	170,911	5.01	2.01	1.08
Cutler-Hammer Mfg Co.	10,546,279	9,345,156[5]	9,340,749	8.22	6.08	.....
Electric Storage Battery Co.	54,199,150	45,640,291	46,219,193	7.31	7.09	7.82
General Electric Co.	326,974,104	312,603,772	337,189,422	6.14	6.41	7.15
Kelvinator Corp [1]	17,163,128	20,122,865	18,120,602	4.34	.....	.....
Maytag Co. [1]	28,722,041	25,582,684	22,527,306	3.29	2.87	2.85
Ohio Brass Co. [2]	2,501,657	2,506,455	2,002,058	8.26	6.90	5.42
Otis Elevator Co. [3]	5,505,400	7,057,641	7,614,106	13.59	12.17	16.09
Radio Corp of America	56,093,505	56,651,658	86,900,153	2.85	6.15	15.98
Sangamo Elec. Co. [1]	3,226,263	3,103,934	2,927,166	.....	3.23	1.61
Wagner Elec. Co. [2]	1,294,773	1,561,169	3,067,988	.....	2.99	3.00
Western Elec. Co.	263,105,194	253,724,013	287,931,396	19.43	4.63	4.93
Westinghouse Electric & Mfg. Co. [3]	166,006,800	185,543,087	175,456,815	6.03	6.91	6.96
Weston Elec. Instrument Co [2]	775,634	573,750	802,816	2.40	1.77	2.78

[1] Net sales. [2] Net profits. [3] Gross income. [4] Sales billed. [5] Based on $100 par.

hydro plant construction, in transmission lines in substations and in distribution equipment for utilities. In the industrial field electric heating, electrochemical and electrometallurgical applications and electric welding promise to be active. A very aggressive sales drive is being made for domestic business, including wiring, lighting and appliances. Only in radio is there an overproduction of appreciable magnitude. Thus the electrical manufacturing industry is starting the new year with every promise of good business, even though it is expected that sales will not be in full volume until March.

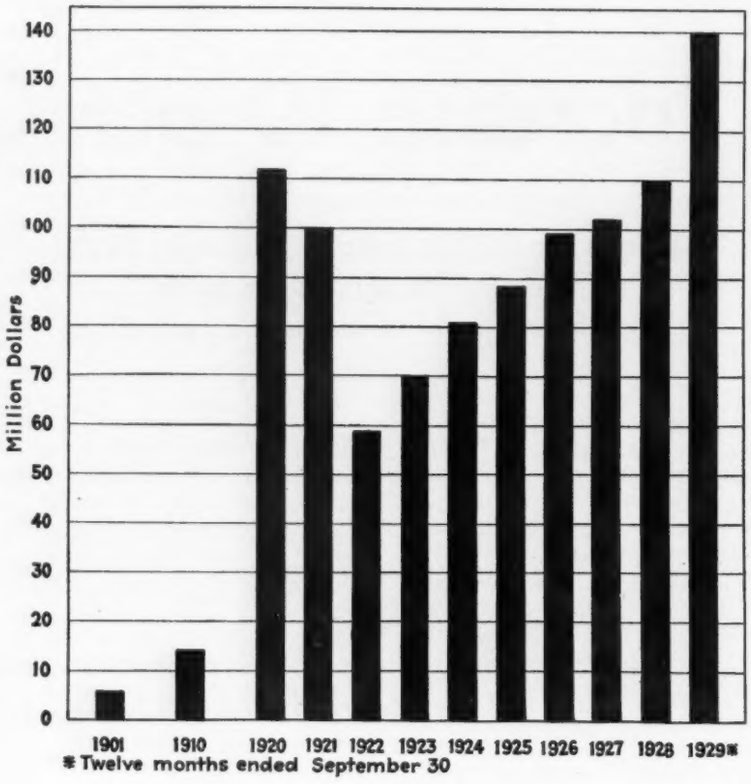
In the field of heavy equipment there was a gain of 20 per cent, as shown in the table headed "sales of major electrical apparatus." Gains were largest in power transformers and generators. The first item includes both steam and waterwheel driven generators as well as large and small turbines. Traction apparatus includes line material and parts for renewals.

The outlook for 1930 in this field is for totals not much in excess of those shown by items for 1929, except in the three classifications including turbines, industrial motors and traction apparatus. The first of these groups will be helped by the general expansion program in the utility and industrial fields. The second will benefit from the same source, and the third from the railroad electrification program now under way.

Apparatus and smaller goods show an increase in 1929 in almost all classifications. Household equipment and miscellaneous domestic appliances show a growth of perhaps 18 per cent. One prominent company shows a 50 per cent gain. Radio equipment output was up about one-third. Wire and cable output increased 15 to 25 per cent and batteries showed a steady growth. Measuring instruments, telephone apparatus, switchboards, panels, etc., expanded in varying amounts, percentage increases ranging from 6 to 20 per cent and over.

The outlook for this field, generally speaking, is for a gain in 1930 comparable to that of 1929 over 1928. In the case of wire and cable and domestic appliances a much greater gain is anticipated. Figures received by the ELECTRICAL WORLD from sixteen representative manufacturers of widely diversified products and whose sales in 1929 aggregated more than half a billion dollars indicate that their 1930 business will exceed that of 1929 by 6 per cent.

Present indications are that electrical equipment exports from the United States for 1929 will exceed those of Germany, which will place America in the lead as an exporter of these products. For the ten months ended October 31 the United States total was $123,582,531, which indicates a year's total of around $150,000,000. Germany's total last year was under $130,000,000. Definite plans are being made by a number of the leading manufacturers to develop the export market on a thoroughly sound and permanent basis rather than merely an outlet during periods of depression here.



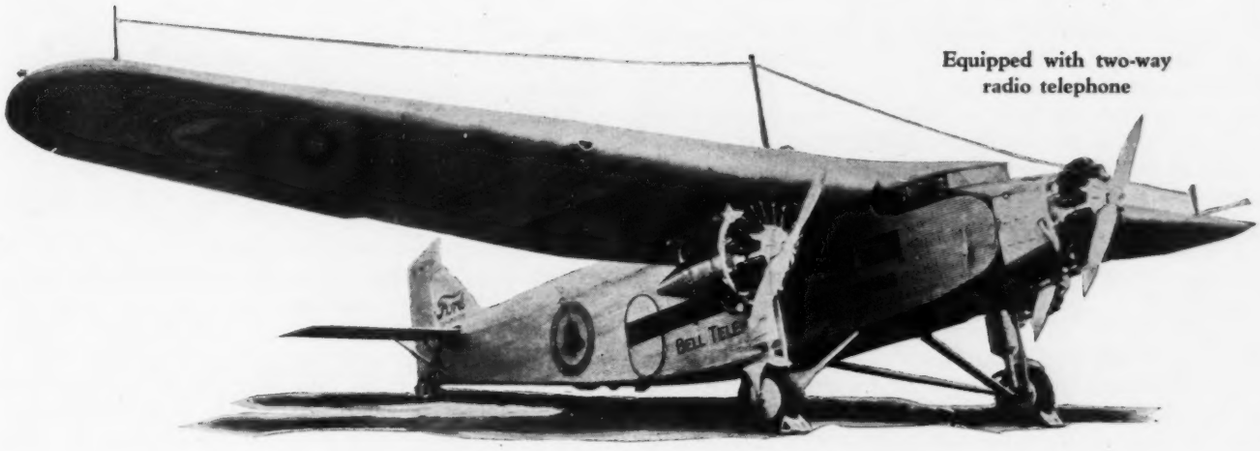
Equipment exports have doubled in six years

1901	$5,812,000	1924	$81,558,092
1910	14,742,000	1925	87,283,552
1920	113,061,000	1926	98,495,245
1921	100,104,720	1927	102,340,060
1922	58,480,166	1928	110,729,121
1923	70,479,668	1929*	140,078,293

*Twelve months ended September 30.

Manufactured Products Increased 27 per Cent 1923-27

	1923	1925	1927
Batteries	$118,065,613	$155,247,811	$150,216,485
Control apparatus	33,176,615	31,302,841	33,869,615
Fans	12,053,861	10,895,769	10,755,001
Generators, motor-generator sets, automotive starting motors	115,797,209	110,185,015	115,179,671
Household, heating and cooking appliances	67,002,084	75,102,165	72,933,274
Industrial apparatus and appliances	6,788,157	10,283,335	12,343,673
Interior conduits and fittings	35,305,341	46,329,735	42,105,294
Lamp bulbs	71,966,225	73,558,210	87,933,204
Instruments, relays, instrument transformers	28,221,484	31,650,355	34,009,999
Motors (not incl. automotive starting), parts and supplies	109,168,685	113,109,577	122,146,337
Radio apparatus and tubes	54,000,470	178,834,697	191,228,647
Switchboards, breakers and switches	57,856,166	69,759,067	70,801,619
Telephone and telegraph apparatus	94,483,885	84,432,662	119,271,904
Transformers, regulators, reactors	49,694,003	62,153,155	66,611,334
Wiring devices	34,966,232	34,806,452	32,216,698
Miscellaneous, including wire	301,788,174	347,819,162	390,193,383
Other products	59,873,805	104,532,033	85,490,897
Total value	$1,293,001,771	$1,540,002,041	$1,637,307,035



Equipped with two-way radio telephone

Telephone Service Forges Ahead

Continued extension of the limits of telephone communication and improvement of its quality, speed and dependability characterized telephone progress during 1929

TO THOSE outside the telephone industry, perhaps the most striking development of the year has been the further extension of transoceanic telephony. The long-wave transatlantic telephone circuit to Great Britain, which has been in operation since January 1, 1927, was supplemented in the summer of 1928 by a short-wave channel; a second was opened June 1, 1929, and a third December 1, giving a total of four telephone circuits to Europe. This increase in facilities has been made necessary by increased volume of traffic and has been made possible by developments in the technique of short-wave telephone transmission. A further addition to the telephone network—a short-wave channel to Buenos Aires, South America—is under construction and is expected to be ready by next spring.

30,000,000 telephones connectable

Due to these developments and to the improvement and extension of foreign telephone systems, a constantly expanding field is offered to the American telephone user. Of a total of about 34,500,000 telephones in the world approximately 29,450,000, or 85 per cent, can be connected with practically any telephone in the United States.

The proposed transatlantic telephone cable is of interest. The development of means for the construction of such a cable was announced by the Bell Telephone Laboratories in 1928. The main link of the proposed cable is expected to extend 1,800 nautical miles from Newfoundland to Ireland. This transatlantic telephone cable has been made possible by many inventions and developments. Prominent among these are "perminvar," used in the continuous "loading" of the copper conductor in the cable (the invention of this material was announced in 1928), and a new insulating material known as "paragutta," which has properties superior to the gutta percha previously employed for submarine cables. This new cable circuit will supplement the transatlantic telephone circuits now in use.

The total number of telephones in the United States as of September 30, 1929, is estimated at 20,000,000 and the total investment at more than four billion dollars. The accompanying table shows the relationship of Bell and connecting telephones.

81,000,000 conversations a day

Telephone conversations for the year ended September 30, 1929, are estimated to average more than 81,000,000 daily, as compared with about 76,000,000 for the same period a year ago. Toll conversations have risen from 3,100,000 to nearly 3,400,000 daily. Employees of operating telephone companies in the United States totaled in excess of 430,000 September 30, 1929, an increase of about 40,000 over September 30, 1928. It is interesting to note that the number of holders of telephone securities continues to increase. On September 30, 1929, there were about 480,000 holders of Bell System common stocks as compared with 475,000 a year previous.

Dial telephone service continues to grow rapidly in extent, the estimated increase during 1929 being 850,000. This brings the total dial telephones to about 4,350,000, or well over 20 per cent of the total stations in the United States.

Much attention is given, in the telephone plant, to

improving the clarity and volume of telephone transmission. The result of this work has been a steady increase in the ease and naturalness of telephone conversation over both local and long-distance circuits. One of the important advances announced during the year 1929 is the development of an improved basic reference system known as the "master reference system for telephone transmission."

The "decibel," one-tenth of the fundamental unit, is employed to express the efficiency of telephone apparatus and circuits.

Illustrative of the numerous improvements in telephone materials and apparatus is a method for treating textile insulating materials so as to improve their insulating properties. This treatment has been found to make cotton an acceptable substitute, under certain conditions, for the more expensive silk and also to improve greatly the insulating properties of the silk.

During the year announcement was made of the development of an 1,818-pair cable, $2\frac{5}{8}$ in. in diameter, for local exchange use which has 50 per cent more conductors than any previous cable. This development not only permits increasing the cable pairs in existing underground ducts, where needed, by substituting the new cable for 1,200-pair cable, but, due to the lower cost per pair mile, its installation, where practicable from a transmission standpoint, will also assist in keeping the cost of the telephone plant from increasing as rapidly as it otherwise would.

1929 rate reductions total $10,000,000

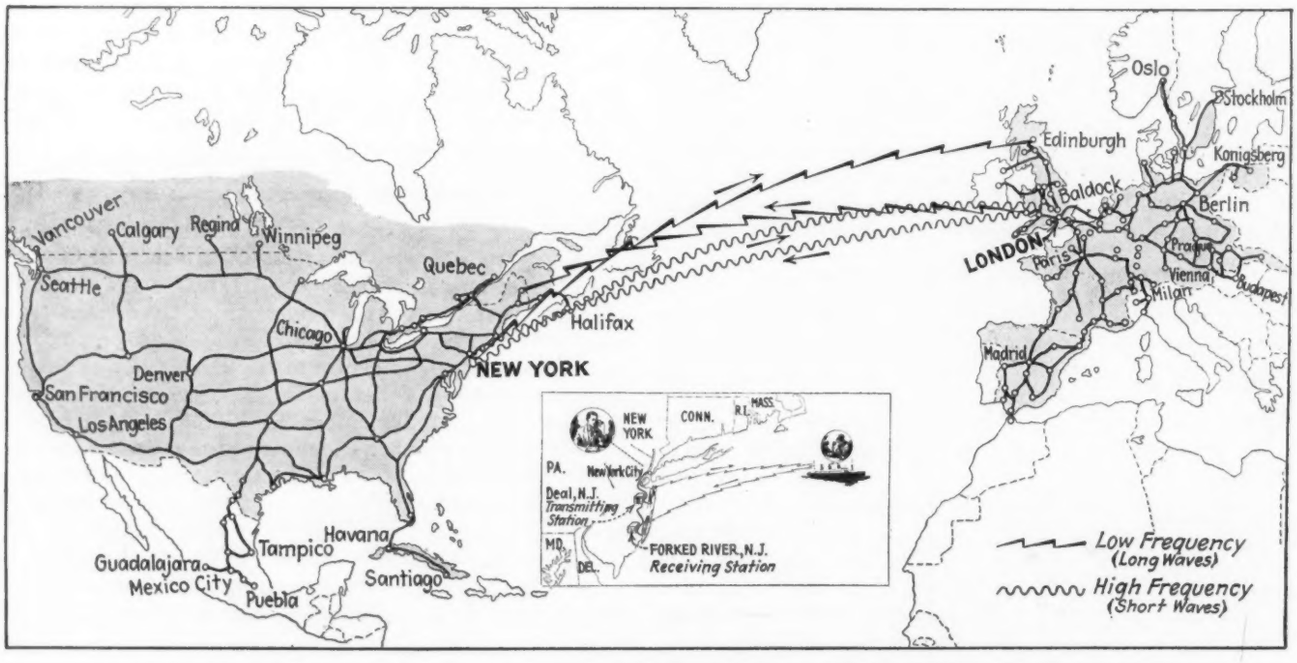
A reduction in day rates was made effective for toll and long-distance calls the early part of 1929, saving customers more than $5,000,000 annually. This is the third reduction in these rates in a little more than two years. A fourth reduction, also representing a saving of about $5,000,000 to the public, went into effect January 1, 1930.

The continued increase in use of the telephone for long-distance calls reflects the customer's favorable reaction to this decreasing cost of the service as well as to its steadily increasing speed and satisfactoriness. About 95 per cent of all toll and long-distance calls are handled while the person calling remains at the telephone, as compared with 90 per cent at the beginning of 1928 and 70 per cent in 1925.

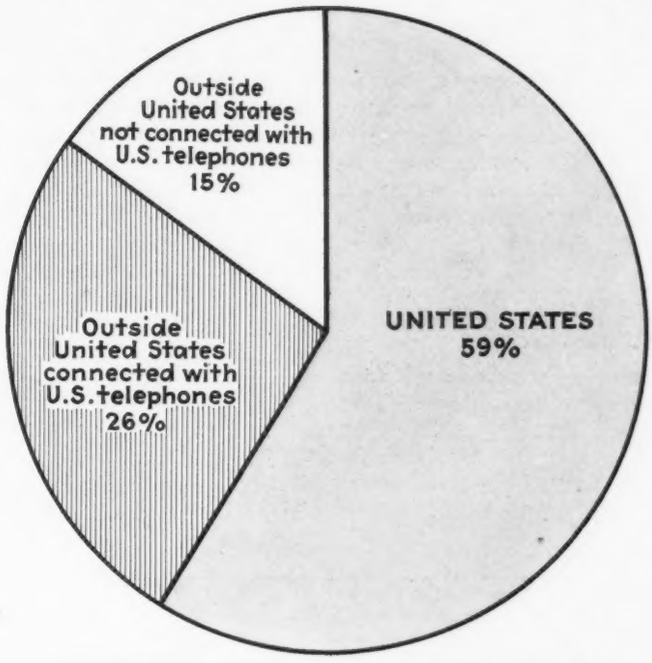
Greatly increased use of loaded and "repeatered" intercity cables carrying a large number of comparatively small wires has occurred during the past few years. It is estimated that 3,700 miles of toll cable were added to this system during 1929, making a present total of more than 13,000 miles. In addition about 1,300 miles of short-haul toll cable were placed—a total addition of 5,000 miles for the year and a present total of toll cable, both long and short haul, for the United States of 20,000 miles. The greater part of this mileage is in the northeastern section of the country, but extensions are being made rapidly in the south and west. A considerable mileage is in operation on the Pacific Coast. These cables, which carry about 300 telephone circuits and as many telegraph circuits, for so-called full size cable, are loaded at intervals of about a mile, while repeater stations are placed about 50 miles apart.

Reducing cost of underground construction

Some of these long-distance cables have been placed underground, while others are suspended aërially. There are many situations where the aërial type of construction satisfactorily meets requirements and it is not as expensive as conduit with manholes at regular intervals. Recently, two new methods have been introduced for securing the advantages of the underground cable more economically. One method involves the use of cable, protected by means of impregnated paper, jute and steel tape covering, and buried directly in the ground, without conduit protection. The second method utilizes a single



TRANSATLANTIC AND SHIP-TO-SHORE TELEPHONE FACILITIES



Eighty-five per cent of world's 35,000,000 telephones reached from any Bell telephone

fiber conduit and standard lead-covered cable. With both systems manholes are placed only at points where loading coils are to be inserted; this has permitted a reduction from about eight per loading section to only one.

The cable is preferably buried on private right-of-way, although in some cases it has been placed along railroad and highways.

An experimental telephone typewriter exchange service was provided recently in telephone company offices in New York, Boston, Chicago and some adjacent cities. The messages typed on the subscriber's keyboard appear

BELL SYSTEM STATISTICS

	Dec. 31, 1910	Dec. 31, 1915	Dec. 31, 1920	Dec. 31, 1925	Dec. 31, 1928	Increase* During 1928
Number of Telephones:						
Bell Companies:						
Manual Service	3,933,056	5,968,110	8,176,884	10,538,935	11,377,632	201,746
Dial Service	0	0	157,095	1,496,289	3,147,016	596,846
Total	3,933,056	5,968,110	8,333,979	12,035,224	14,524,648	798,592
Bell Connecting Companies and Lines	1,949,663	3,204,385	4,267,956	4,685,000	4,672,387	32,957
Total	5,882,719	9,172,495	12,601,935	16,720,224	19,197,035	831,549
Number of Connecting Companies	7,396	8,735	9,231	9,227	8,381	*511*
Number of Connecting Rural Lines	10,449	19,579	26,032	28,861	30,415	*1*
Number of Central Offices	4,933	5,300	5,702	6,017	6,224	109
Miles of Pole Lines	282,877	330,602	358,091	386,064	398,026	5,512
Miles of Exchange Wire:						
Underground Cable	5,630,851	9,947,359	14,384,135	28,425,392	37,843,154	2,681,198
Aerial Cable	2,800,000	4,503,124	5,586,531	9,462,213	13,503,157	1,381,573
Open Wire	1,247,367	1,601,579	1,633,802	1,953,235	2,069,381	73,542
Total Exchange Wire	9,678,218	16,052,062	21,604,468	39,840,840	53,415,692	4,136,313
Miles of Toll Wire:						
Underground Cable	386,088	625,792	1,363,398	2,057,196	3,237,550	512,505
Aerial Cable	70,000	98,804	299,385	1,209,332	2,947,233	625,376
Open Wire	1,507,906	1,728,887	2,110,153	2,366,172	2,592,269	95,655
Total Toll Wire	1,963,994	2,453,483	3,772,936	5,632,700	8,777,052	1,233,536
Total Miles of Wire	11,642,212	18,505,545	25,377,404	45,473,540	62,192,744	5,369,849
Average Daily Telephone Conversations:†						
Exchange	21,681,471	25,183,799	31,835,353	46,702,307	56,195,936	3,614,702
Toll	602,539	819 030	1,327,247	2,098,163	2,839,072	224,629
Total	22,284,010	26,002,829	33,162,600	48,800,470	59,035,008	3,839,331
Number of Employees‡	120,311	156,294	231,316	293,095	334,335	25,424

*Decreases shown in italics. †For year ending December 31.
‡The employees of the Western Electric Company, Inc., numbering approximately 56,000 on December 31, 1928, are not included.

instantly on the distant machine. Connections are established by operators after notification by the customer of what is wanted.

Police organizations have found telephone typewriters serviceable where an alarm has to be broadcast or where a record is desired. A large installation was made in New York City about two years ago involving something over 100 stations. More recently a statewide installation has been placed in operation in Connecticut connecting fourteen cities and towns. An installation for the Pennsylvania State Police consisting of about 100 stations is expected to go into service soon.

Plane-to-ground communication

Two-way telephone communication between airplane and ground has been the subject of experimental and development work for some time. Largely as a result of this work, two-way radio telephony for plane-to-ground communication has advanced to the point where commercial apparatus is just becoming available and regular transport planes of several lines will soon be equipped with it. This should add greatly to the safety and reliability of air transportation.

The San Francisco-Los Angeles weather reporting network established last year on an experimental basis has since been taken over by the Airway Division of the Department of Commerce. Through the co-operation of the Department of Commerce and the Bell Companies, similar systems have been established along the New York-Chicago airway. An even more extensive system has been put in operation for the Transcontinental Air Transport along its air-rail route.

In these systems telephone typewriter circuits connect the meteorological collection and distribution centers. This information is relayed to planes in the air by means of radio telephone transmitting sets.

Ship-to-shore communication

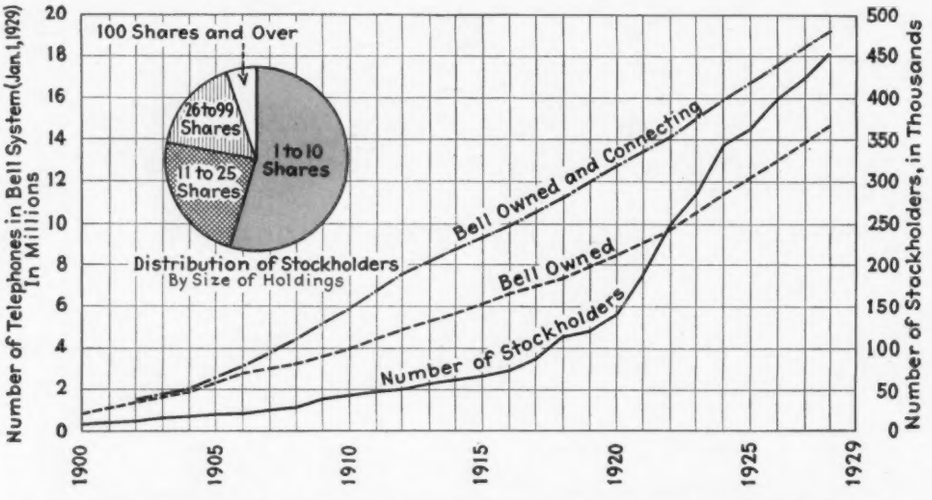
Ship-to-shore telephone communication was demonstrated by a series of tests carried out by the American Telephone & Telegraph Company from 1919 to 1922. An experimental two-way radio telephone system has been in operation recently between the *Leviathan* and a New Jersey shore station where connections have been made to the wire telephone system. Commercial ship-to-shore telephone service was made available for the first time December 8 from the *Leviathan*.

While no commercial application of television has yet been made in this country, there was further progress in fundamental development during 1929. Television in colors was demonstrated last June in the Bell Telephone Laboratories. This employs a new type of photo-electric cell responsive to all the colors of the visible spectrum as compared with the former type, which was sensitive only at the blue-green end. Special argon tubes combined with the neon tubes previously used, together with color filters and new arrangements of apparatus, are employed. Moving as well as stationary objects can be clearly seen in their natural colors.

Widespread Bond Issue

The 1929 convertible bond offer of the American Telephone & Telegraph Company is believed to be the largest ever offered to stockholders for subscription by any corporation, the principal amount of the issue being in excess of $219,000,000. If all of the convertible bonds issued should under a certain option, be converted into stock at $180 per share during 1930, the company would receive an additional $175,000,000, or a total of nearly $400,000,000. This offering was a marked success, a total of more than 161,000 subscriptions being received. Of the subscribers, 49.7 per cent were women, 43.7 per cent men and 6.6 per cent banks, brokers, corporations and others.

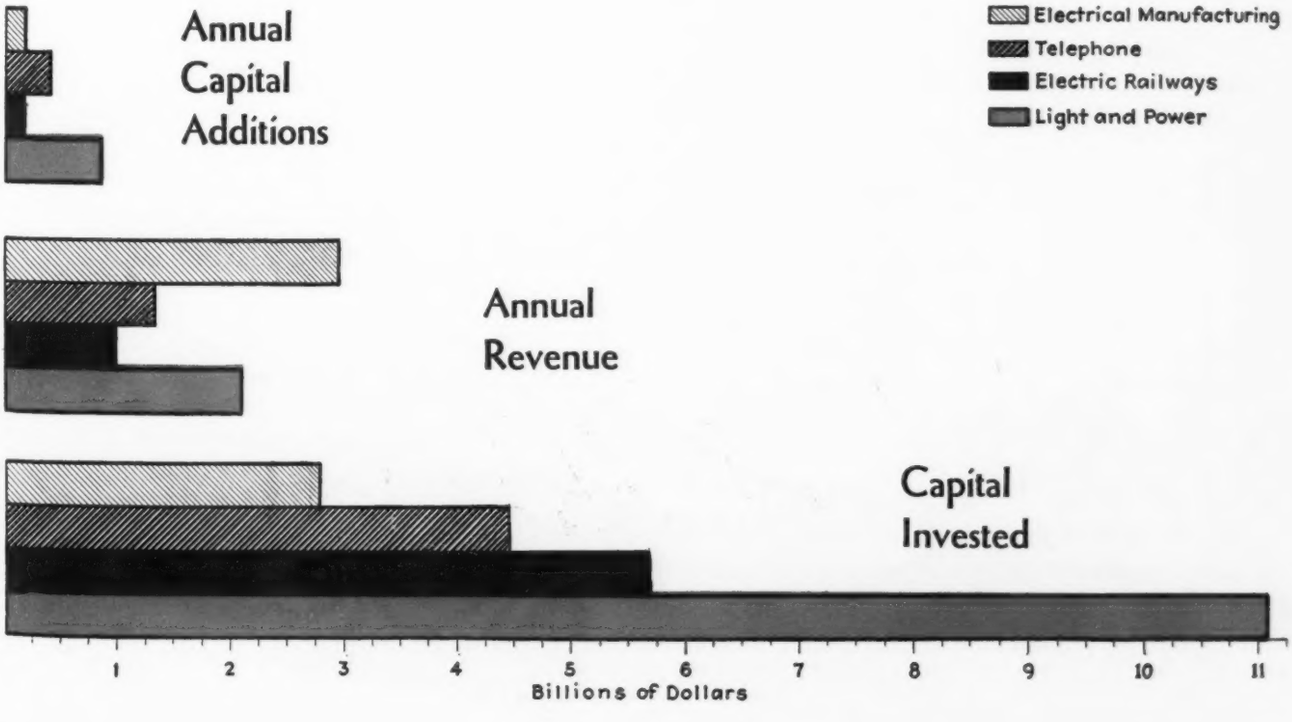
Inasmuch as the stock of the company is very widely distributed and the average holding is only about 28 shares, the task of advising stockholders of their rights, was stupendous. More than 385,000 stockholders, or 85 per cent of the total, received fractional warrants, some with, some without, full warrants, and all of these fractional warrants had to be pieced out in order that they might be utilized in subscriptions. In order to handle this bond issue the company utilized more than 200 of its permanent employees and a maximum of about 600 temporary employees. Indicative of the efficiency with which this transaction was carried out is the fact that only a negligible percentage of the rights of stockholders were allowed to lapse.

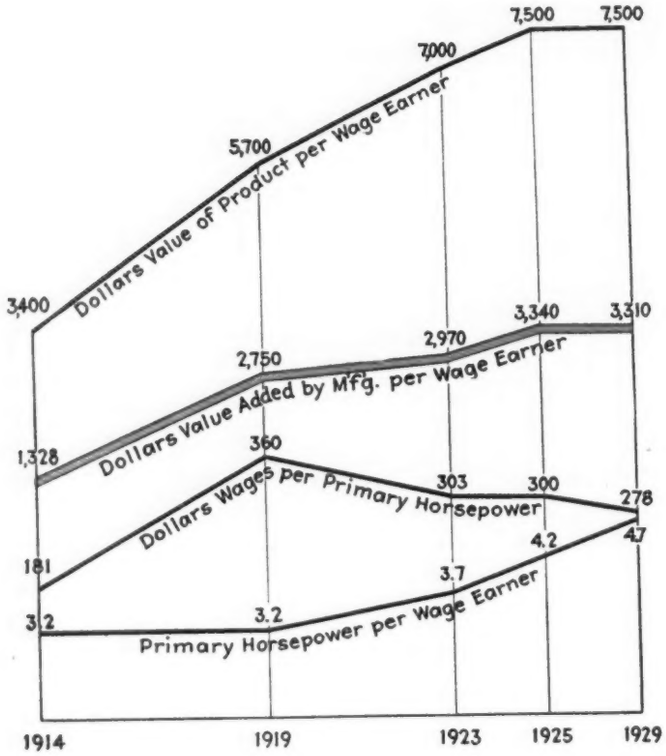


One telephone for every six persons and 450,000 stockholders

THE CHIEF BRANCHES OF THE ELECTRICAL INDUSTRY

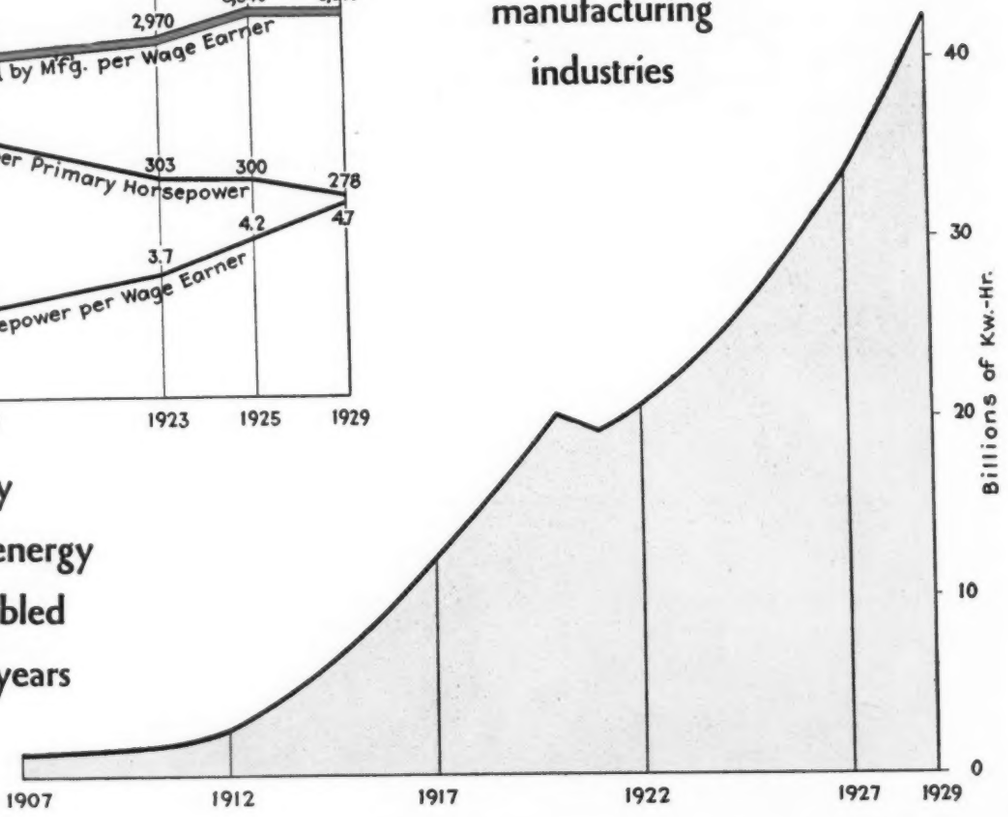
AT THE BEGINNING OF 1930

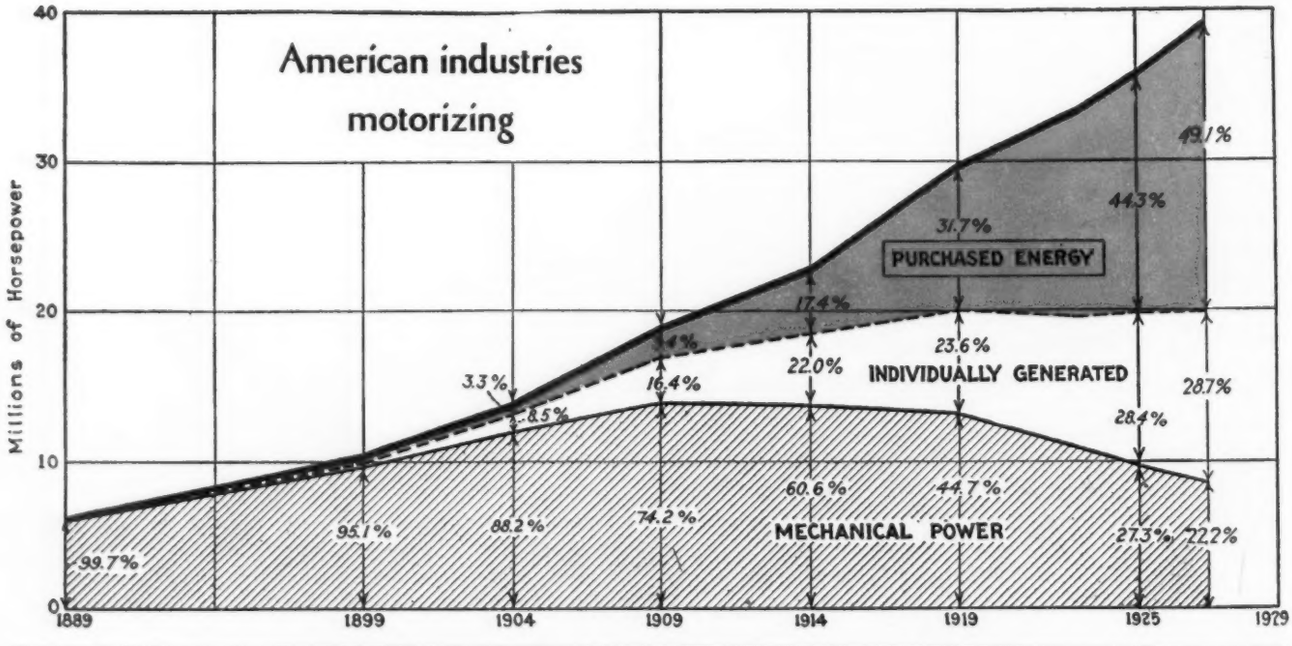




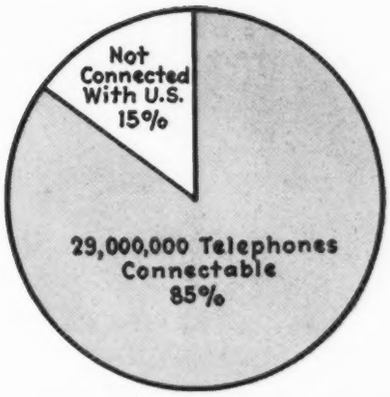
Electric power contributes to growth of manufacturing industries

Utility wholesale energy sales doubled in seven years

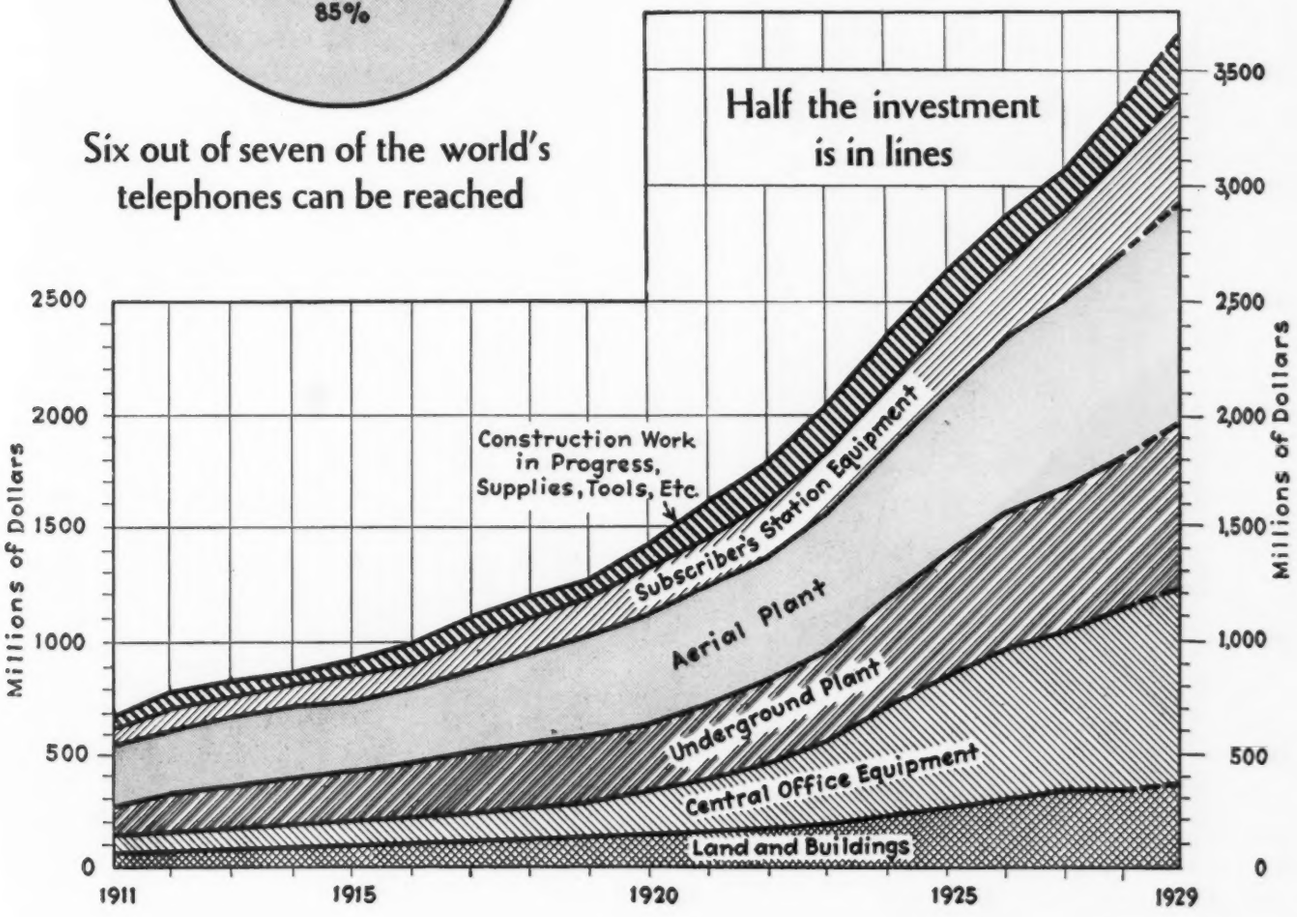


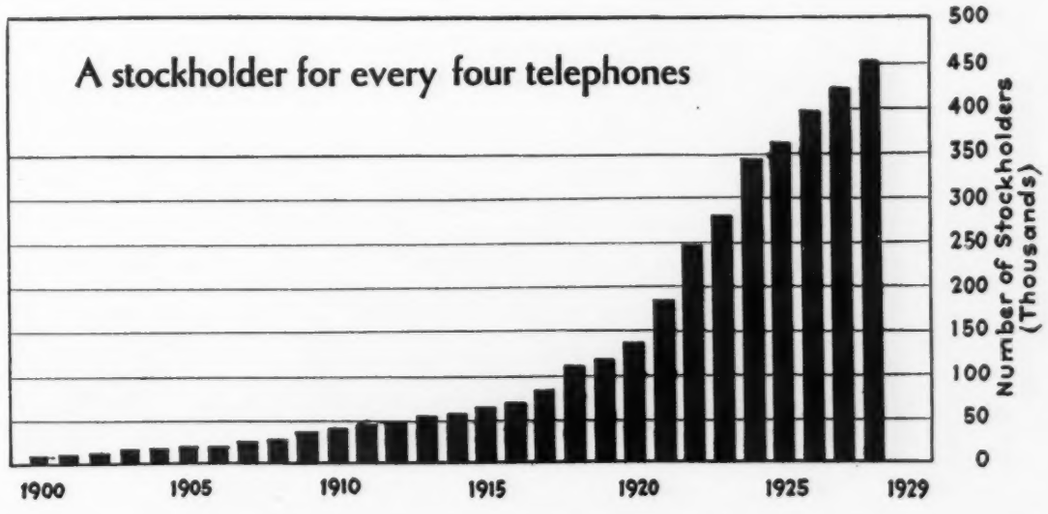


Telephone Progress Has Been Rapid in the United States

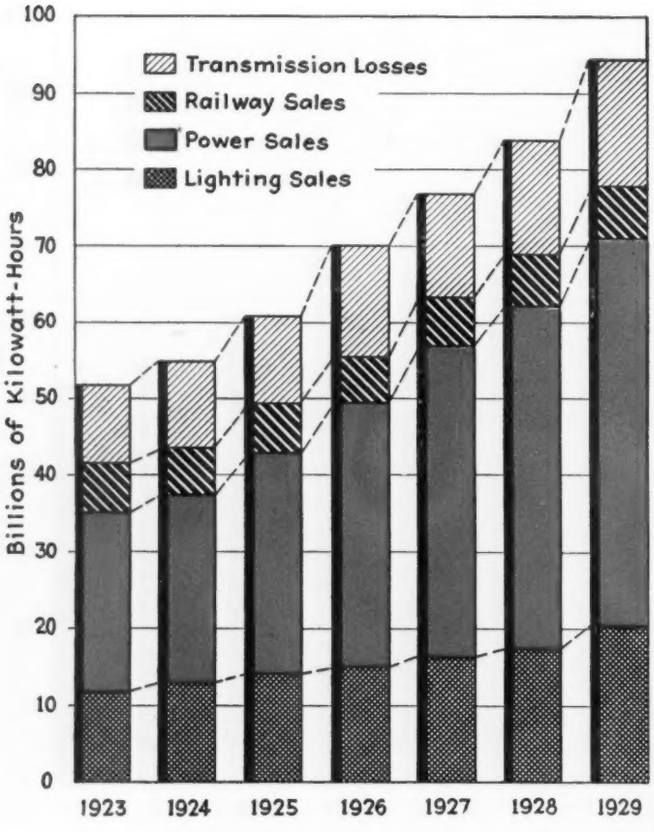


Six out of seven of the world's telephones can be reached

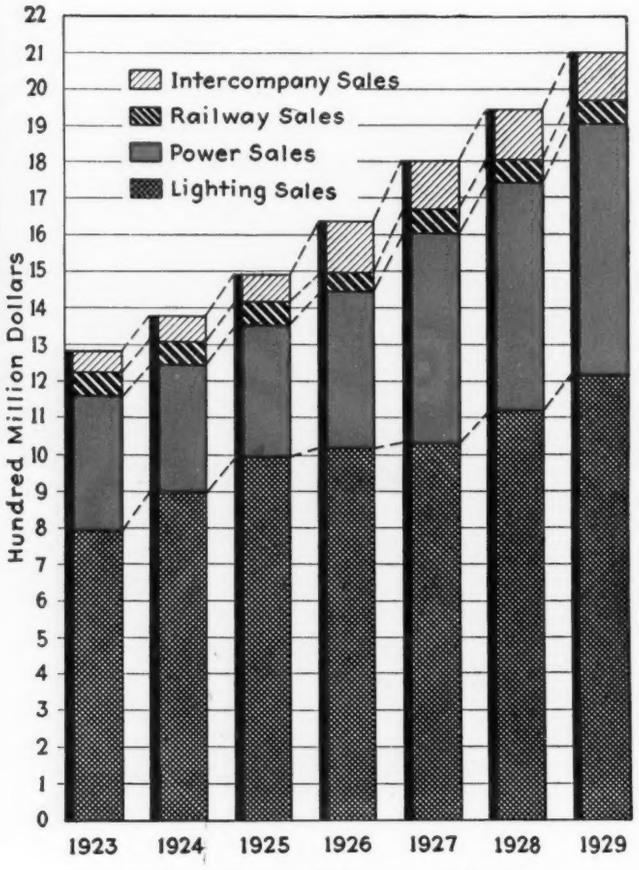




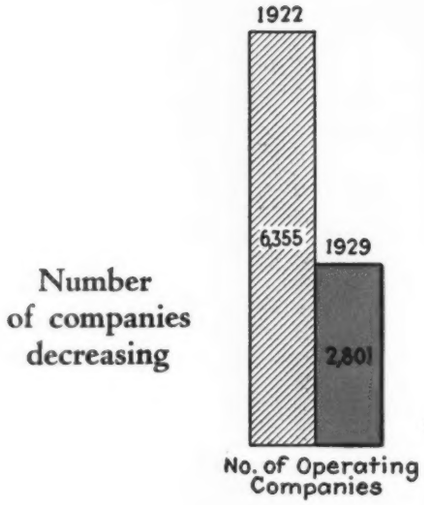
The Light and Power Industry in United States



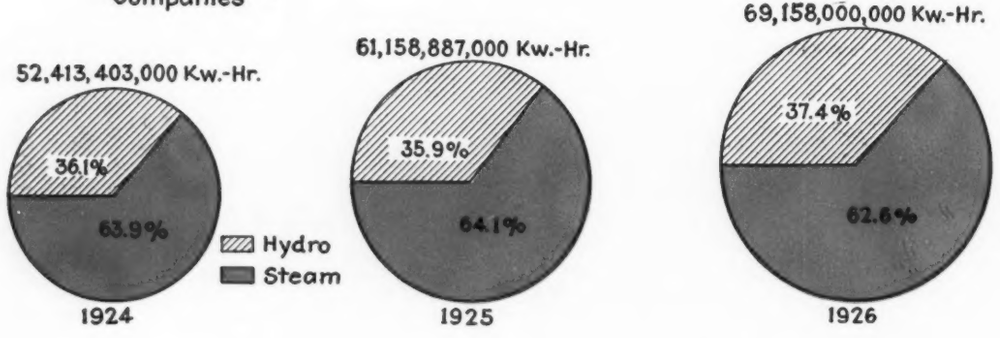
Power sales outweigh all others



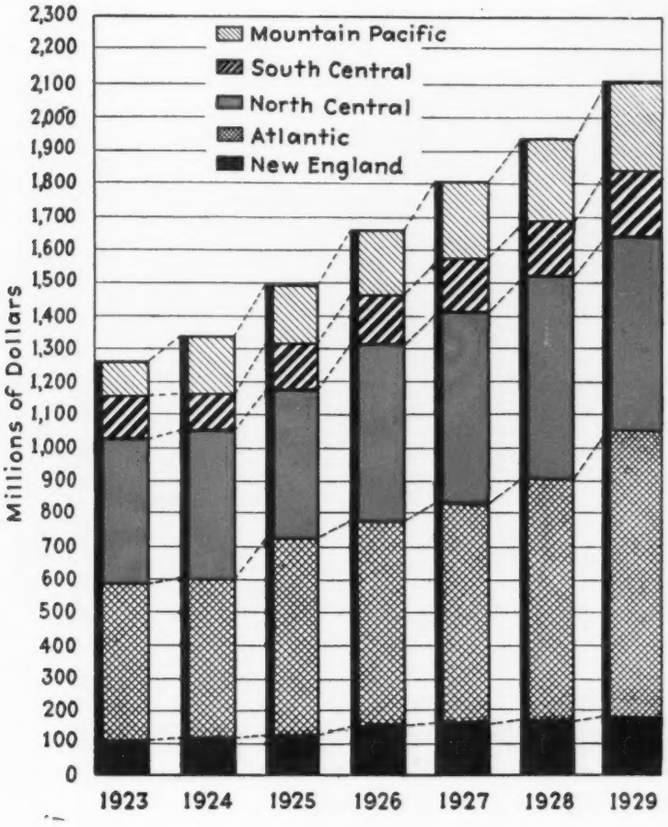
Lighting provides more than half the revenue



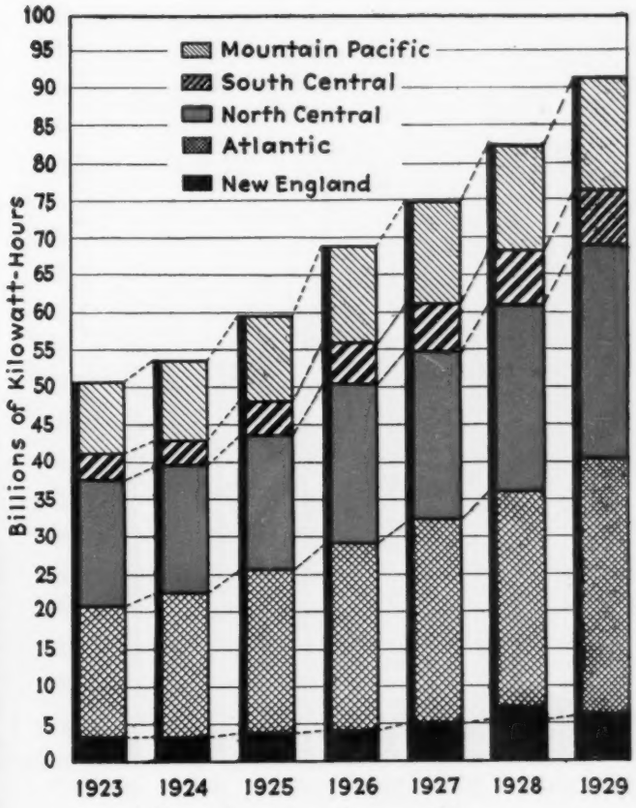
Steam Generation Ratio



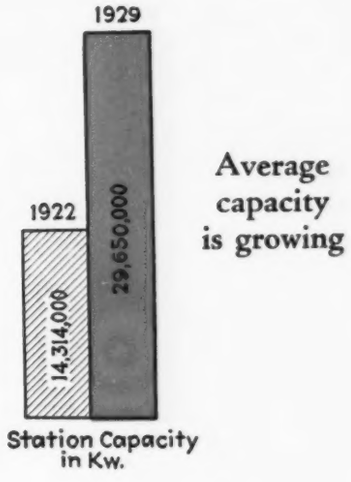
Power Industry the States



Revenue increase closely parallels growth in energy production

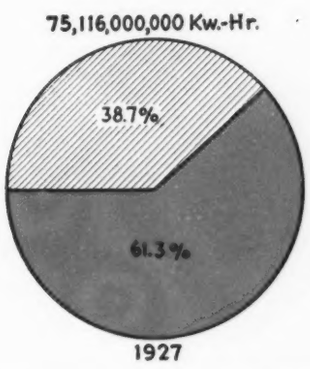


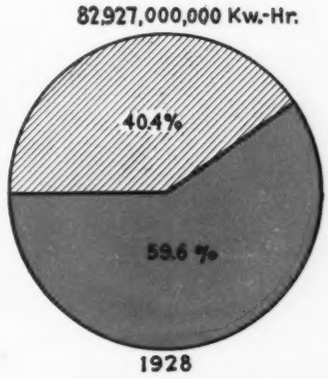
All regions are increasing their output

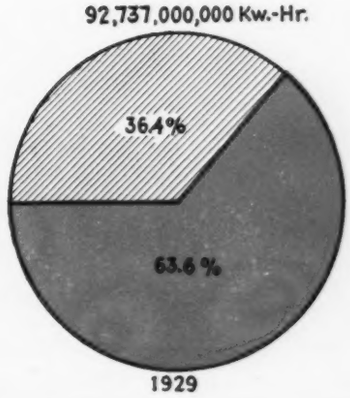


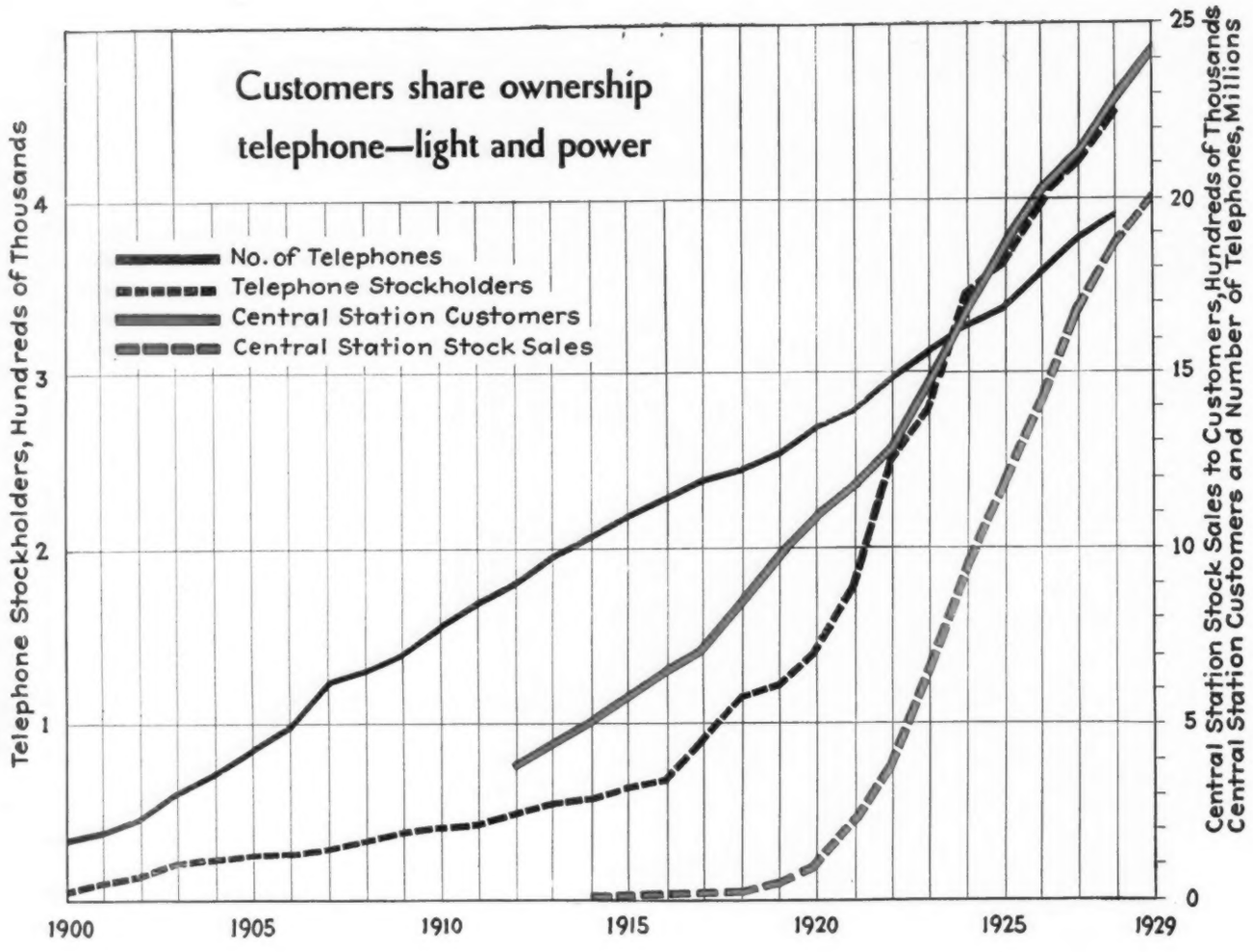
Average capacity is growing

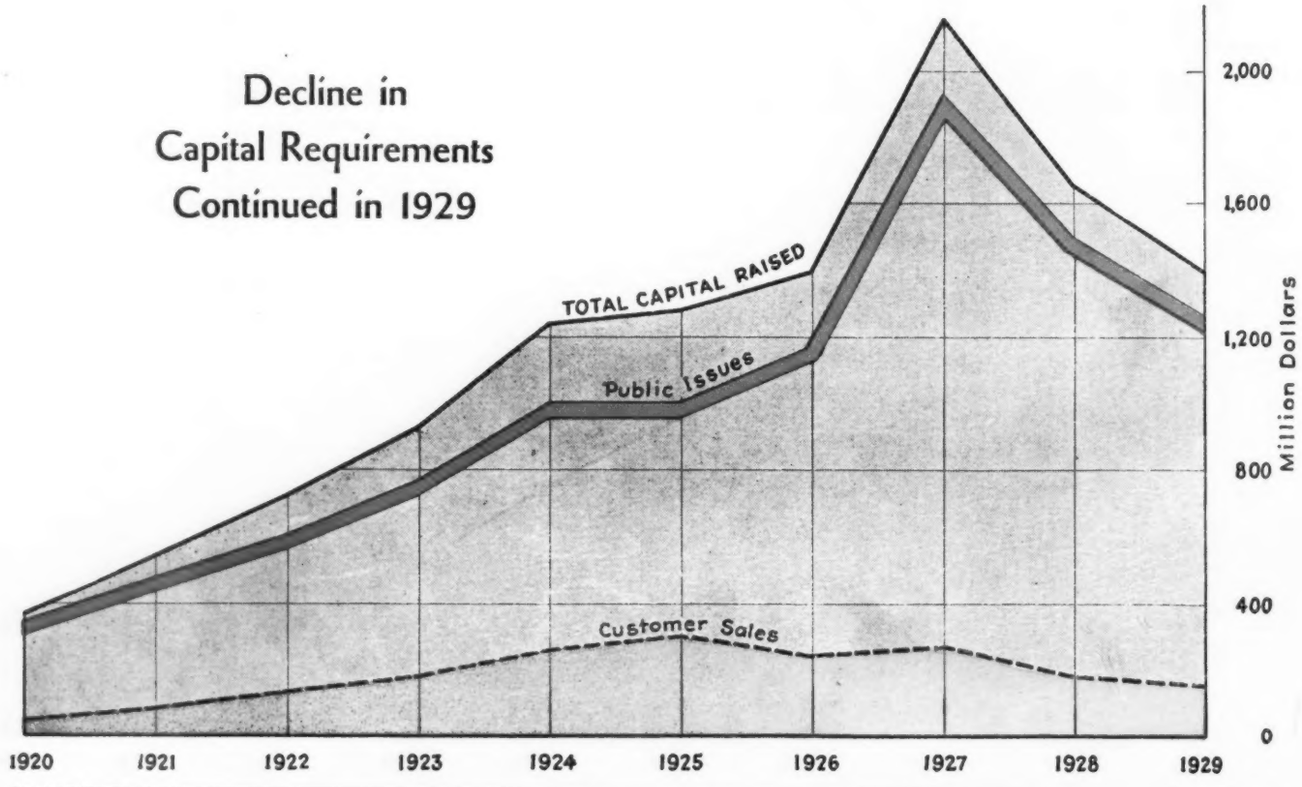
Increased in 1929

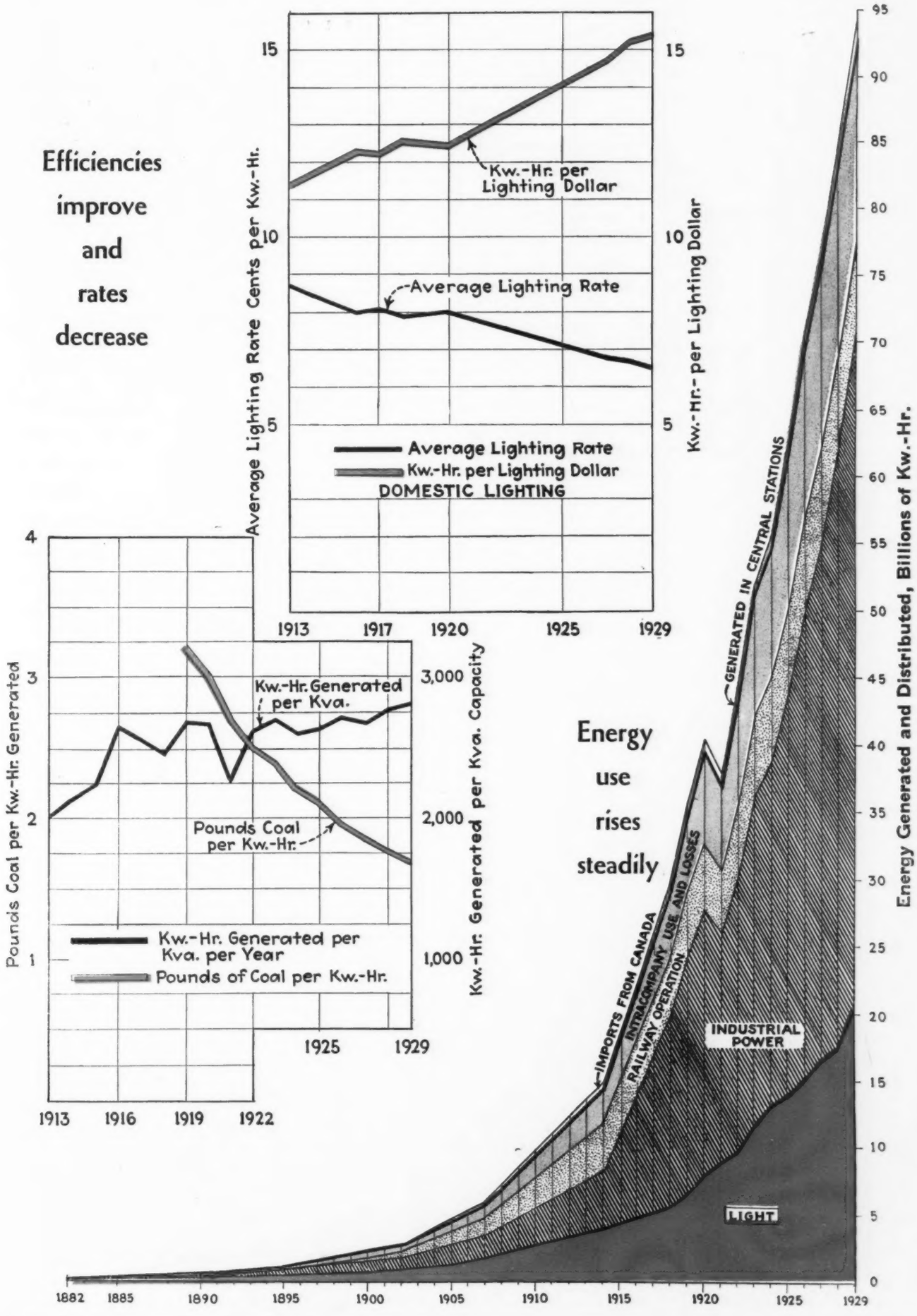


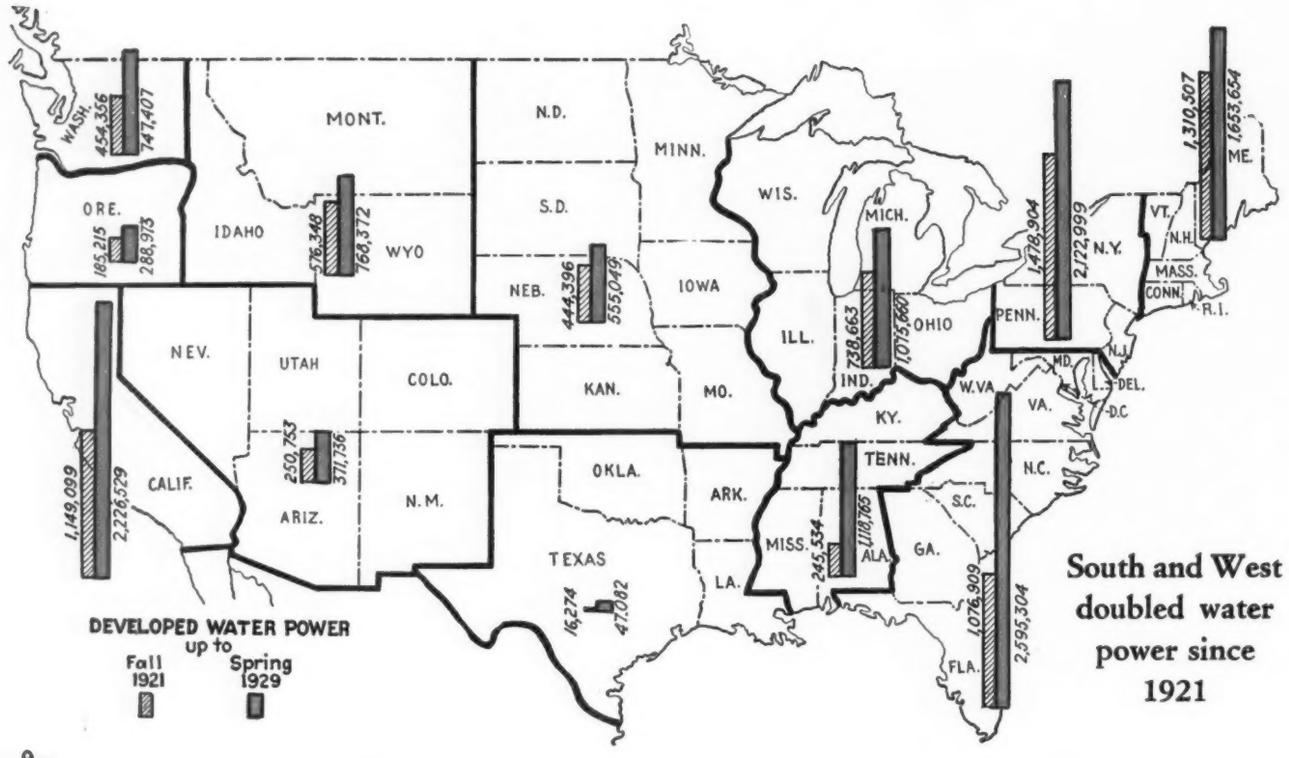





Customers share ownership
telephone—light and power
No. of Telephones
Telephone Stockholders
Central Station Customers
Central Station Stock Sales
Telephone Stockholders, Hundreds of Thousands
Central Station Stock Sales to Customers, Hundreds of Thousands
Central Station Customers and Number of Telephones, Millions
1
2
3
4
0
5
10
15
20
25
1900
1905
1910
1915
1920
1925
1929

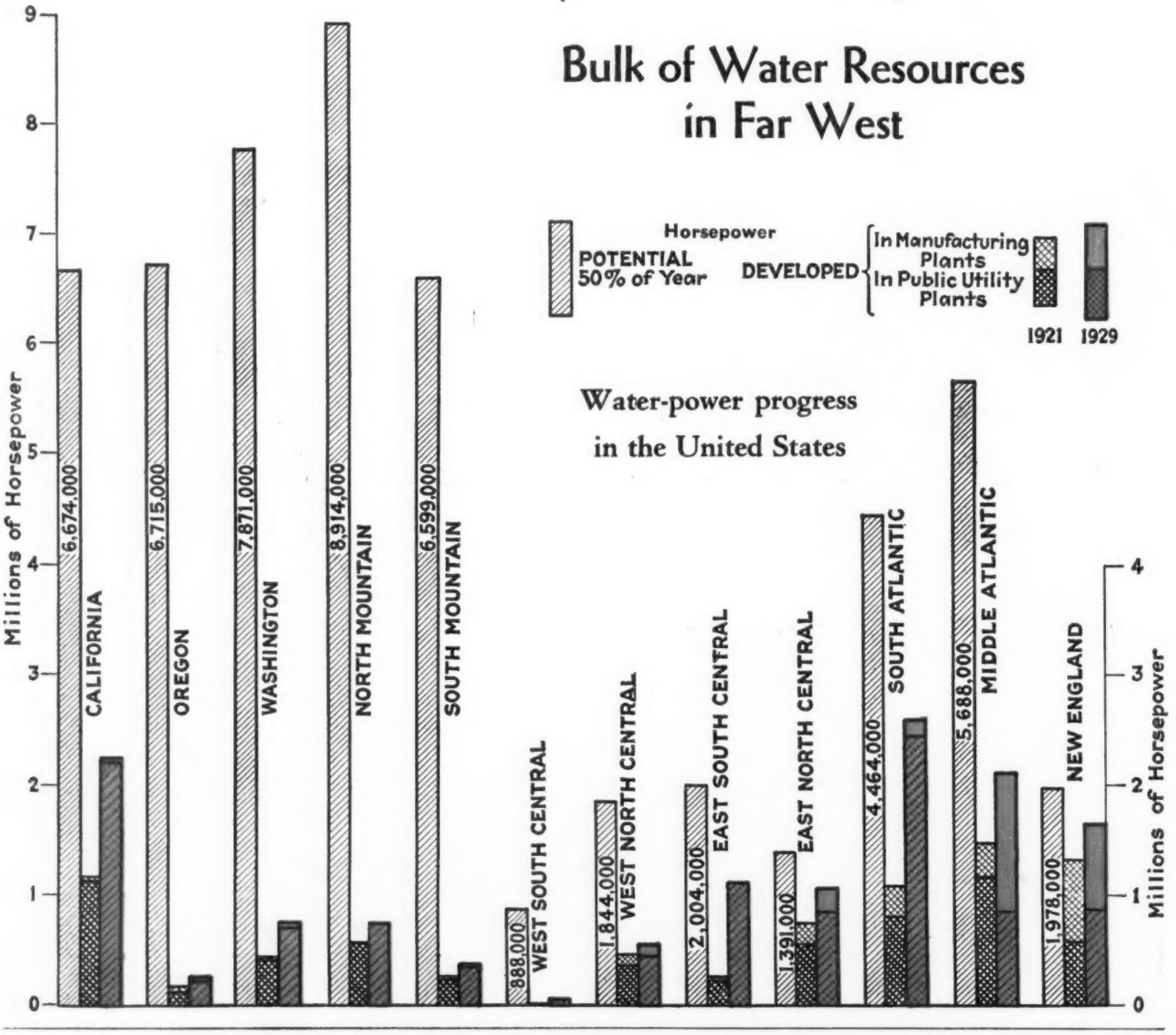

Decline in
Capital Requirements
Continued in 1929
TOTAL CAPITAL RAISED
Public Issues
Customer Sales
Million Dollars
0
400
800
1,200
1,600
2,000
1920
1921
1922
1923
1924
1925
1926
1927
1928
1929


Efficiencies improve and rates decrease
Average Lighting Rate Cents per Kw.-Hr.
Kw.-Hr. per Lighting Dollar
Kw.-Hr. per Lighting Dollar
Average Lighting Rate
Average Lighting Rate
Kw.-Hr. per Lighting Dollar
DOMESTIC LIGHTING
1913
1917
1920
1925
1929
Pounds Coal per Kw.-Hr. Generated
Kw.-Hr. Generated per Kva.
Pounds Coal per Kw.-Hr.
Kw.-Hr. Generated per Kva. Capacity
Kw.-Hr. Generated per Kva. per Year
Pounds of Coal per Kw.-Hr.
1913
1916
1919
1922
1925
1929
Energy use rises steadily
GENERATED IN CENTRAL STATIONS
IMPORTS FROM CANADA
INTRACOMPANY USE AND LOSSES
RAILWAY OPERATION
INDUSTRIAL POWER
LIGHT
Energy Generated and Distributed, Billions of Kw.-Hr.
1882
1885
1890
1895
1900
1905
1910
1915
1920
1925
1929



South and West doubled water power since 1921

Bulk of Water Resources in Far West

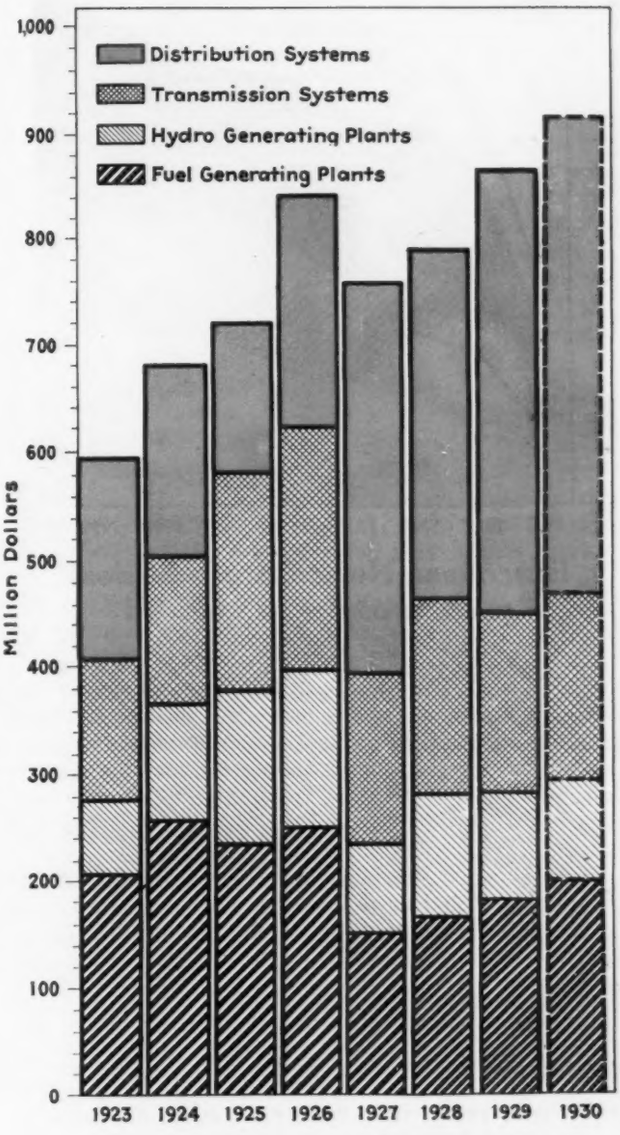


1930 BUDGET $913,574,905

Light and power companies increase capital expenditures 6 per cent over the year 1929. Distribution leads, with steam plants second. All regions active in construction

TELEGRAMS to the ELECTRICAL WORLD from light and power companies, both private and municipal, indicate a budget of $913,574,905 for 1930 and expenditures of $866,344,050 for 1929. This is the largest budget in the history of this branch of the industry, even though 1929 witnessed record-breaking expenditures.

Business has been above normal in all sections during 1929 as measured in terms of energy generation and the utilities find it necessary to expand their facilities to keep up with the demand for electric service. Every section of the country expects to increase its capital expenditures in 1930. The largest increase will be in steam station building, with a total of $196,854,802, or 22 per cent of the budget; distribution remains the big item in capital expenditure with a total of $378,788,740, or 41 per cent of the budget, and to this should be added miscellaneous expenditures for offices, buildings, transportation equipment, etc., aggregating $64,075,890. Expenditures for transmission lines total $178,642,561, or 20 per cent of the budget. Only in hydro plant construction is there a slight decrease in 1930, the figures being $95,212,912, as against $98,911,941 in 1929.



Distribution expenditures to be nearly half total

In 1930 the total expenditure for generation aggregates $292,067,714, while transmission and distribution expenditures amount to $557,431,301. These figures compare with $281,460,095 for generation and $528,896,198 for transmission and distribution in 1929. Thus about 32 per cent of the total budget is spent for generation each year and 61 per cent for transmission and distribution.

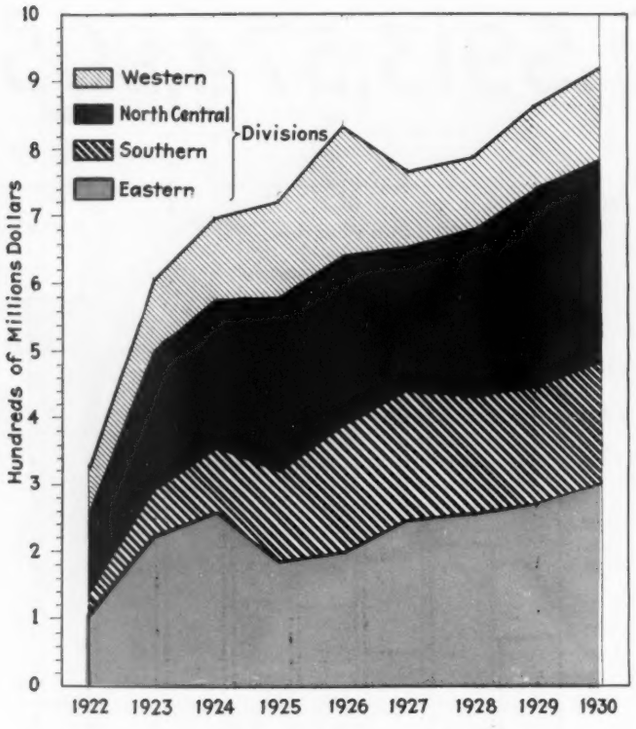
There is little change in expenditures in the different geographical areas. The Middle Atlantic leads with $219,817,412, with the East North Central next with

Table I—Generation and Transmission Expenditures

Thousands of Dollars

Year	Total Construction Budgets	Total Expenditures for Generating Plants	Total Expenditures for Transmission and Distribution	Miscellaneous† Expenditures
1921	$222,408	$102,674	$119,734	.....
1922	324,016	164,333	159,683	.....
1923	602,143	283,813	318,330	.....
1924	692,440	379,240	313,200	.....
1925	721,300	380,000	341,300	.....
1926	841,344	400,107	441,237	.....
1927	760,353	234,883	525,470	.....
1928	786,978	284,874	453,796	48,308
1929	866,344	281,460	528,896	55,988
1930*	913,575	292,068	557,431	64,076

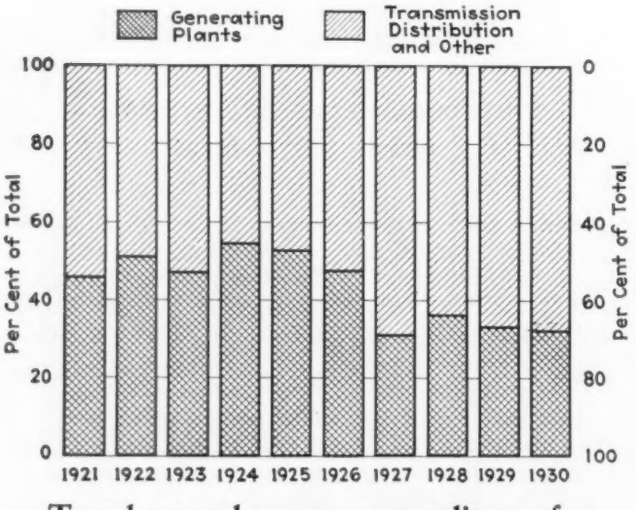
*Budget estimates. †Not separated in earlier years.



Eastern and North Central divisions to spend 65 per cent of total

$202,643,381. The least expenditure will be in the Mountain States, where the total aggregates $16,870,000. In the heavy load areas the larger sums are spent and each region expects to spend about the same percentage increase. There is evidence that major lines and plants are projected in each area and in all regions money will be spent for distribution in large amounts.

There is some flexibility in utility budgets, both as to expenditure and as to completion of expenditures in a year, but it is very promising to find the utilities making plans for a large expansion program and there is little indication of any curtailment on expenditures.



Trend toward greater expenditures for distribution and transmission

Table II—System Expenditures

Thousands of Dollars

Year	Eastern	Southern	North Central	Western	Totals for U. S.
1923	$211,196	$82,105	$206,180	$102,662	**$602,143**
1924	259,850	104,460	218,950	109,180	**692,440**
1925	190,300	130,500	260,200	140,300	**721,300**
1926	200,107	190,500	280,605	170,132	**841,344**
1927	247,961	191,190	213,994	107,208	**760,353**
1928	253,277	182,322	244,060	107,319	**786,978**
1929	265,847	176,585	293,564	130,348	**866,344**
1930	299,505	180,611	295,639	137,820	**913,575**

Table III—Steam Power Plant Expenditures

Thousands of Dollars

Year	Eastern	Southern	North Central	Western	Totals for U. S.
1925	$95,000	$20,000	$100,000	$25,000	**$240,000**
1926	80,107	30,000	120,000	25,000	**255,107**
1927	53,593	35,128	43,585	13,711	**146,017**
1928	49,841	45,537	58,749	16,906	**171,033**
1929	53,891	37,600	75,299	15,758	**182,548**
1930	56,776	41,805	81,274	17,000	**196,855**

Table IV—Hydro Plant Expenditures

Thousands of Dollars

Year	Eastern	Southern	North Central	Western	Totals for U. S.
1925	$15,000	$50,000	$20,000	$55,000	**$140,000**
1926	20,000	60,000	20,000	45,000	**145,000**
1927	39,436	21,913	6,020	21,497	**88,866**
1928	38,717	43,926	8,610	22,588	**113,841**
1929	28,784	21,575	25,071	23,482	**98,912**
1930	26,690	24,000	18,735	25,788	**95,213**

Table V—Transmission Expenditures

Thousands of Dollars

Year	Eastern	Southern	North Central	Western	Totals for U. S.
1925	$35,000	$45,200	$80,200	$45,300	**$205,700**
1926	50,000	60,456	60,605	60,000	**231,061**
1927	32,147	47,830	61,055	22,121	**163,153**
1928	71,097	28,999	67,519	18,575	**186,190**
1929	44,015	35,059	60,589	27,902	**167,565**
1930	57,135	35,052	62,271	24,184	**178,642**

Table VI—Distribution Expenditures

Thousands of Dollars

Year	Eastern	Southern	North Central	Western	Totals for U. S.
1925	$45,300	$15,300	$60,000	$15,000	**$135,600**
1926	50,000	40,044	80,000	40,132	**210,176**
1927	122,785	86,320	103,344	49,878	**362,317**
1928	80,927	51,753	88,960	45,966	**267,606**
1929	122,401	73,457	109,444	56,029	**361,331**
1930	138,836	72,412	107,042	60,499	**378,789**

Constructing 6,000,000 Kva.

Proportion of hydro generation reduced

West South Central leads in per cent growth

Utilities double output with only 32 per cent coal increase

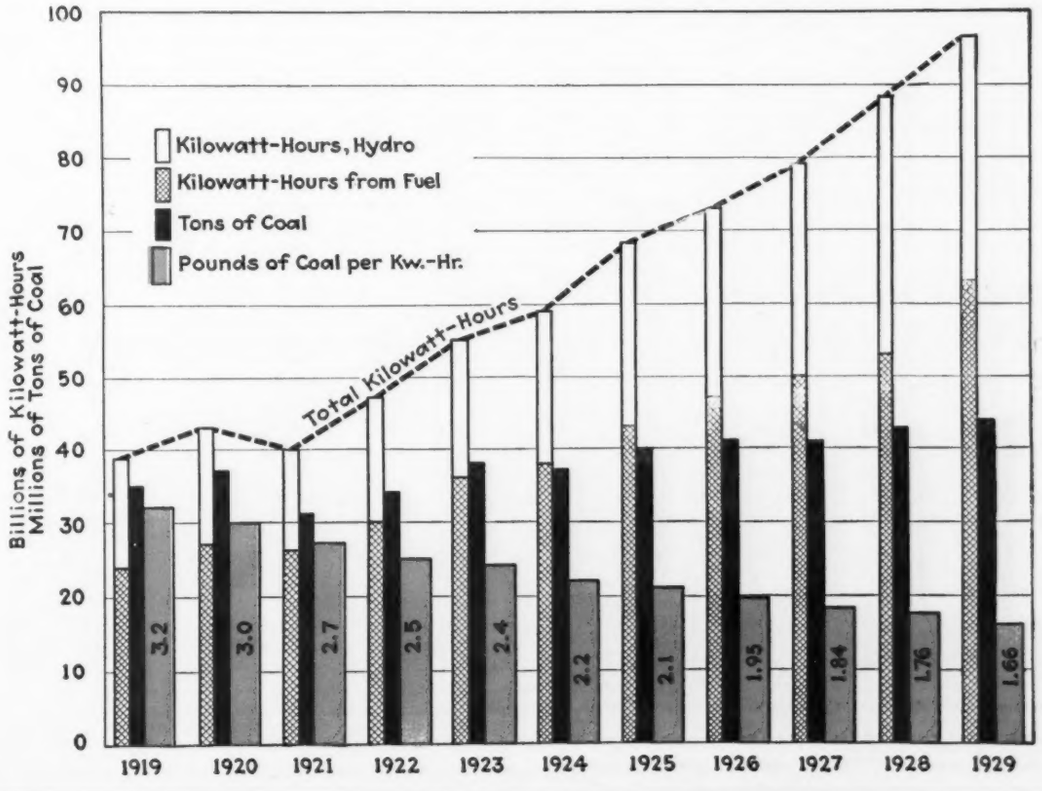
Fourteen new steam plants total 1,375,000 kw., 21 new hydro plants over 100,000 hp., each nearly 3,000,000 hp. under Federal license

MORE than 3,000,000 kw. of generating equipment was installed in 3,700 public utility stations, including municipal plants, at the end of 1929, and about 6,000,000 kva. is reported to be in course of construction. About 25 per cent of the existing kva. was in hydro plants and 70 per cent in steam plants. Based on ten months figures for 1929, these stations turned out nearly 98,000,000,000 kw.-hr. Of this 93,000,000,000 kw.-hr. came from electric light and power plants, compared with 25,000,000,000 in 1917, or nearly quadruple the output twelve years ago. Since that time the proportion generated by water power has reduced about 4 per cent, only 36 per cent having been so produced in 1929 and 64 per cent by fuel. The increasing predominance of steam is due to the reduction of fixed and operating expenses for steam, the dearth of water-power sites that can be economically developed, the effect of legislative and political interference and the greater attention being given to over-all system economy rather than individual station economy.

With the exception of one section of the United States (East South Central), the rate of growth of output since 1927 has ranged from 13 per cent to 50 per cent. The West South Central shows the biggest per cent increase in the last two years. Named in the order of growth, the remaining sections rank as follows: South Atlantic, East North Central, New England, West North Central, Pacific, Middle Atlantic and Mountain.

The net energy imported in 1929 by utilities, chiefly at Niagara, was 1,600,000,000 kw.-hr., or only 1.7 per cent of the total generated and imported. More than 17,000,000,000 kw.-hr. was purchased for resale. It was this exchange and imported energy which permitted handling loads most economically, enabled coping with emergency situations and allowed staggering the con-

97 per cent more energy from 30 per cent more fuel since 1921



Generator Rating of Public Utility Plants*

November 1, 1929

	Operating Companies	Plants	Capacity of Generators Kw.	Operated By — Water Power — No.	Water Power — Capacity Kw.	Steam Power — No.	Steam Power — Capacity Kw.	Internal Combustion Engines — No.	Internal Combustion Engines — Capacity Kw.	Combination of 2 or More of Others — No.	Combination of 2 or More of Others — Capacity Kw.
UNITED STATES	1,657	3,766	30,319,950	1,234	7,866,807	1,606	21,185,668	590	233,380	336	1,034,095
New England	158	325	2,578,480	196	569,453	81	1,862,685	4	4,297	44	142,045
Middle Atlantic	179	417	7,508,115	177	1,134,992	189	6,185,760	16	13,935	35	173,428
East North Central	329	700	7,024,768	234	542,124	385	6,252,742	23	12,669	58	217,233
West North Central	361	681	2,067,685	99	287,581	321	1,574,420	190	62,809	71	142,875
South Atlantic	195	433	3,793,166	141	1,541,634	212	2,083,062	50	30,329	30	138,141
East South Central	94	207	1,559,440	34	797,942	115	705,595	42	10,993	16	44,910
West South Central	138	440	1,349,318	7	14,456	156	1,110,183	231	85,094	46	139,585
Mountain	128	281	982,106	150	671,738	81	271,396	27	11,714	23	27,258
Pacific	75	282	3,456,872	196	2,306,887	66	1,139,825	7	1,540	13	8,620
NEW ENGLAND											
Maine	30	74	194,947	63	156,076	4	36,250	1	267	6	2,354
New Hampshire	17	47	108,700	29	60,227	6	22,435	0	0	12	26,038
Vermont	27	70	172,244	59	156,784	2	9,350	0	0	9	6,110
Massachusetts	56	87	1,323,614	26	118,651	49	1,122,085	2	2,040	10	80,838
Rhode Island	4	7	243,125	2	1,375	4	241,375	0	0	1	375
Connecticut	24	40	535,850	17	76,340	16	431,190	1	1,990	6	26,330
MIDDLE ATLANTIC											
New York	86	249	4,314,356	142	1,035,388	78	3,255,066	4	3,661	25	20,241
New Jersey	15	28	651,775	3	880	21	639,815	2	2,050	2	9,030
Pennsylvania	79	140	2,541,984	32	98,724	90	2,290,879	10	8,224	8	144,157
EAST NORTH CENTRAL											
Ohio	76	115	2,134,637	7	8,300	95	2,044,998	6	1,882	7	79,457
Indiana	58	112	696,603	17	28,454	86	650,694	2	1,544	7	15,911
Illinois	63	126	2,127,322	12	40,275	103	2,034,770	4	3,947	7	48,330
Michigan	71	169	1,341,845	94	242,666	56	1,083,494	5	787	14	14,898
Wisconsin	61	178	724,361	104	222,429	45	438,786	6	4,509	23	58,637
WEST NORTH CENTRAL											
Minnesota	59	114	486,796	34	136,011	70	325,994	8	2,277	12	22,514
Iowa	66	137	441,377	30	120,575	75	242,714	20	8,765	12	69,323
Missouri	61	98	490,781	3	14,900	56	457,122	30	13,195	9	5,564
North Dakota	15	33	46,404	0	0	24	44,958	9	1,446	0	0
South Dakota	25	54	52,357	5	3,830	18	36,288	26	5,808	5	6,431
Nebraska	61	122	191,724	21	6,445	45	152,490	36	9,267	20	23,522
Kansas	74	123	358,246	6	5,820	43	314,854	61	22,051	13	15,521
SOUTH ATLANTIC											
Delaware	7	7	32,015	0	0	6	31,735	1	280	0	0
Maryland	18	25	603,837	4	252,996	17	329,573	2	1,268	2	20,000
District of Columbia	3	3	199,500	1	3,000	2	196,500	0	0	0	0
Virginia	29	71	408,232	26	54,530	28	272,481	6	1,800	11	79,421
West Virginia	19	44	572,722	8	56,130	28	511,257	5	4,695	3	640
North Carolina	29	74	759,667	47	532,262	23	218,660	2	865	2	7,880
South Carolina	20	45	494,306	21	360,780	20	111,111	0	0	4	22,415
Georgia	32	83	353,955	31	265,336	48	87,959	4	660	0	0
Florida	38	81	358,932	3	16,600	40	323,786	30	20,761	8	7,785
EAST SOUTH CENTRAL											
Kentucky	26	53	336,802	4	104,720	38	229,670	8	1,822	3	590
Tennessee	30	57	332,539	18	102,322	25	189,318	9	2,344	5	37,555
Alabama	17	43	835,025	12	590,900	22	240,642	6	1,258	3	2,225
Mississippi	21	54	55,074	0	0	30	45,965	19	5,569	5	3,540
WEST SOUTH CENTRAL											
Arkansas	18	75	91,766	2	9,666	44	75,702	23	3,503	6	2,895
Louisiana	24	45	255,190	0	0	13	243,867	30	11,078	2	245
Oklahoma	49	104	284,389	2	1,500	40	245,704	52	26,043	10	11,142
Texas	47	216	717,973	3	3,290	59	544,910	126	44,470	28	125,303
MOUNTAIN											
Montana	11	31	226,276	17	215,238	9	8,738	2	590	3	1,810
Idaho	19	44	224,342	38	219,782	4	2,000	0	0	2	2,560
Wyoming	21	34	47,091	9	10,976	17	33,202	8	2,913	0	0
Colorado	28	57	211,416	22	55,020	31	155,486	1	200	3	710
New Mexico	14	24	28,807	0	0	12	20,370	7	4,154	5	4,283
Arizona	12	28	101,360	9	68,448	7	15,600	6	2,452	6	14,860
Utah	18	53	132,314	49	93,864	1	36,000	1	465	2	1,985
Nevada	5	10	10,500	6	8,410	0	0	2	940	2	1,150
PACIFIC											
Washington	22	69	632,651	44	525,631	16	103,510	2	175	7	3,335
Oregon	22	61	263,465	37	148,270	17	111,540	3	430	4	3,225
California	31	152	2,560,756	115	1,632,986	33	924,775	2	935	2	2,060

*The table relates to all electric public utility plants of 100 kw. or larger, including electric light and power (both private and municipal), electric railway, Bureau of Reclamation and a few manufacturing plants selling energy for public utlity purposes.

The omission of the very small plants, probably fewer than 1,000, does not appreciably affect the aggregate rating. It does, however, correspondingly decrease the number of operating companies: many such plants are operated municipally, and as small towns usually have only one plant the omission of the latter necessarily involves also the omission of the town, counted as an operating company.

struction of new stations so they would be loaded most promptly.

The West South Central and Mountain States continue to lead in their proportions of steam-generated and hydro-generated energy respectively, the first-named section producing about 99 per cent with steam and the latter 84 per cent with water. Steam production also dominates in the East North Central, West North Central and Middle Atlantic States, hydro production in the East South Central and Pacific states. However, the proportion of hydro generation on the Pacific Coast was reduced from 90 per cent in 1927 to 75 per cent in 1929.

Nearly 42,000,000 short tons of coal were used for generation last year in central station plants, about 9,500,000 bbl. of fuel oil and 113,000,000,000 cu.-ft. of gas. Nearly 70 per cent of the coal was used in the East North Central and Middle Atlantic states and about the same percentage of the total oil consumption by the Pacific, South Atlantic and West South Central utilities. Eighty per cent of the gas was consumed in the West South Central and Pacific Coast plants.

It is interesting to observe that some 98,000,000,000 kw.-hr. were produced in all utilities (including railways) with a fuel consumption only 32 per cent larger than was required seven years ago to produce only 48,000,000,000 kw.-hr. This is largely due to the refinement in methods of burning coal and the more economical operating conditions brought about by interconnected operation of systems.

A number of notable steam plants were completed in 1929, among which the following figure conspicuously

Total Energy and Fuel-Generated Energy in Public Utility Plants

Including electric light and power, electric railway, Bureau of Reclamation and certain other plants generating energy for public consumption.

Year	Kw.-Hr. Generated in all Public Utility Plants (Millions)	Kw.-Hr. Generated from Fuel (Millions)	Coal Consumed (Millions of Tons)	Coal Equivalent of All Fuel† (Millions of Tons) Total	Pounds of Coal per Kw.-Hr.
1919	38,921	24,176	35.10	38.88	3.2
1920	43,555	27,248	37.13	41.43	3.0
1921	40,976	25,863	31.59	35.25	2.7
1922	47,659	30,240	34.18	38.01	2.5
1923	55,674	36,092	38.96	43.53	2.4
1924	59,014	38,808	37.56	43.14	2.2
1925	65,870	42,264	40.23	44.79	2.1
1926	73,791	47,274	41.32	45.86	1.95
1927	80,205	50,330	41.88	45.91	1.84
1928	87,850	53,154	41.35	46.39	1.76
1929*	97,704	63,085	45.33	52.53	1.66

*Estimated, based on ten months' operations.
†Includes oil and natural gas.

OUTPUT OF CENTRAL-STATION HYDRO AND FUEL POWER PLANTS*

(100 per cent of the industry)

	Energy Generated During 1927				Energy Generated During 1928				Energy Generated During 1929†			
	Hydro Plants		Fuel Power Plants		Hydro Plants		Fuel Power Plants		Hydro Plants		Fuel Power Plants	
	Millions of Kw.-Hr.	Per Cent of Total	Millions of Kw.-Hr	Per Cent of Total	Millions of Kw.-Hr.	Per Cent of Total	Millions of Kw.-Hr.	Per Cent of Total	Millions of Kw.-Hr.	Per Cent of Total	Millions of Kw.-Hr.	Per Cent of Total
UNITED STATES	29,461	38.8	46,320	61.2	33,508	40.4	49,418	59.6	33,673	36.4	59,064	63.6
New England	1,971	39.8	2,989	60.2	2,305	43.0	3,045	57.0	2,015	33.1	4,060	66.9
Middle Atlantic	6,070	31.8	13,040	68.2	6,296	31.4	13,738	68.6	6,267	28.2	15,918	71.8
East North Central	2,327	12.7	15,969	87.3	2,539	12.3	17,998	87.7	2,484	10.8	20,492	89.2
West North Central	1,582	34.6	2,990	65.4	1,588	33.0	3,228	67.0	1,542	28.5	3,868	71.5
South Atlantic	2,999	34.7	5,627	65.3	5,521	53.3	4,841	46.7	6,424	54.3	5,399	45.7
East South Central	2,217	66.5	1,121	33.5	2,428	79.5	628	20.5	2,575	77.0	775	23.0
West South Central	67	2.0	3,185	98.0	53	1.2	3,974	98.8	66	1.3	4,825	98.7
Mountain	2,935	87.2	430	12.8	3,297	88.5	426	11.5	3,168	83.6	623	16.4
Pacific	9,299	90.1	968	9.9	9,483	86.1	1,539	13.9	9,132	74.6	3,104	25.4

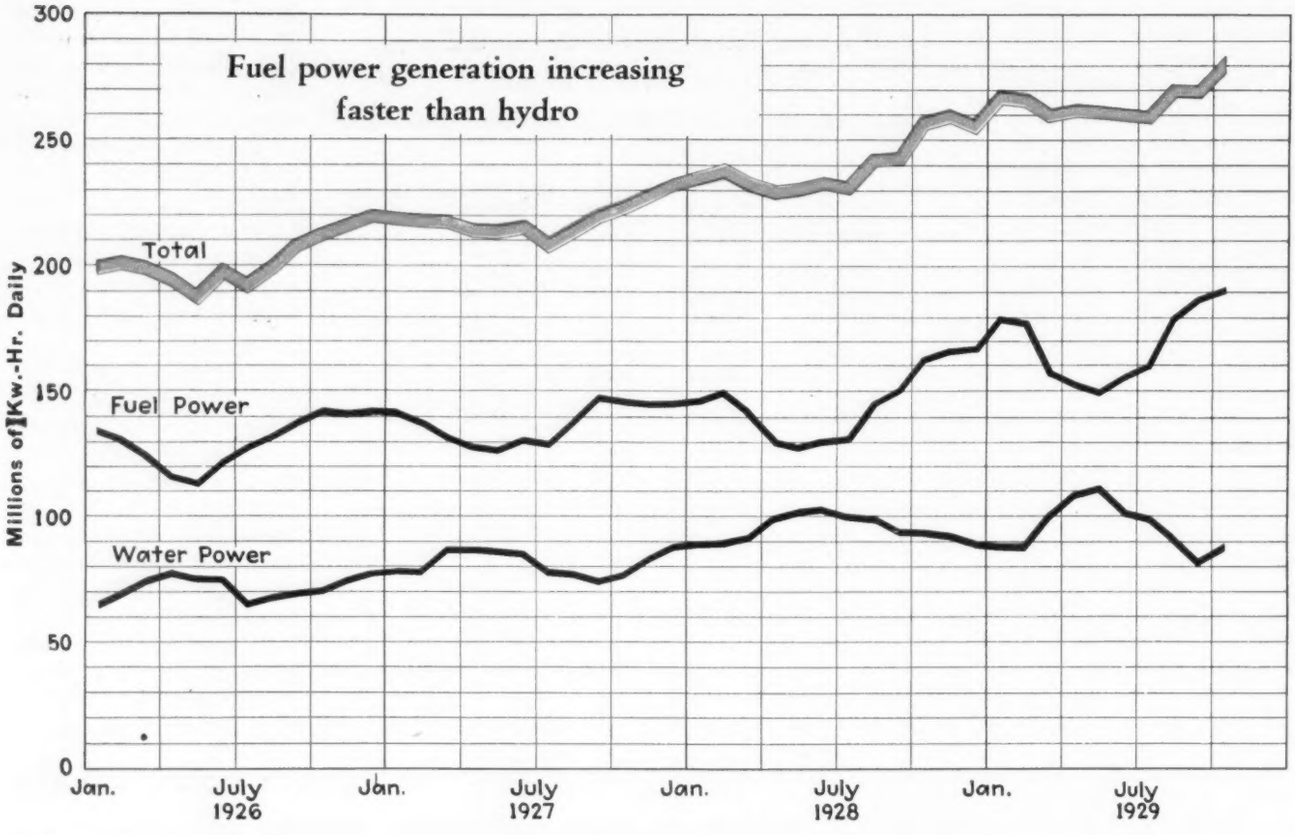
*Data collected by U. S. Geological Survey. †Based on ten months' operations.

CONSUMPTION OF FUEL BY CENTRAL-STATION STEAM POWER PLANTS*

(100 per cent of the industry)

	Coal (Thousands Short Tons)			Fuel Oil (Thousands Barrels)			Gas (Millions Cubic Feet)		
	1927	1928	1929†	1927	1928	1929†	1927	1928	1929†
UNITED STATES	37,657	37,593	41,794	6,487	6,852	9,477	61,836	77,054	112,672
New England	2,204	2,214	2,675	849	541	1,525	0	0	0
Middle Atlantic	10,597	10,714	12,122	277	280	280	125	92	94
East North Central	14,156	15,305	16,686	68	85	79	5,519	4,207	4,505
West North Central	3,143	3,252	3,677	814	935	917	8,596	8,739	11,989
South Atlantic	4,416	3,515	3,896	2,004	2,035	2,264	159	187	159
East South Central	1,272	821	799	58	78	99	2	0	3,390
West South Central	1,341	1,262	1,247	918	1,128	861	39,779	50,149	66,431
Mountain	520	469	623	203	234	416	516	831	809
Pacific	7	42	67	1,294	1,536	3,035	7,140	12,849	25,294

*Data collected by U. S. Geological Survey. †Based on ten months' operations.



ENERGY GENERATED IN CENTRAL STATION, RAILWAY AND OTHER UTILITY PLANTS

Figures for 1926, 1927, and 1928 are taken from reports of the U. S. Geological Survey; 1929 figures are based on ten months' operation.

	Electrical Energy Generated (Thousands of Kilowatt-Hours)			
UNITED STATES	1926	1927	1928	1929
	73,791,064	80,205,474	87,849,579	97,703,605
New England	5,165,955	5,470,556	5,958,843	6,687,015
Middle Atlantic	20,526,802	21,716,770	22,657,059	24,859,937
East North Central	17,663,578	18,843,349	20,946,994	23,345,154
West North Central	4,586,814	4,841,453	5,125,705	5,715,969
South Atlantic	7,197,294	8,768,076	10,499,780	12,002,358
East South Central	3,049,199	3,407,700	3,326,276	3,638,088
West South Central	2,639,520	3,315,382	4,035,380	4,912,766
Mountain	3,424,715	3,520,047	3,917,948	3,990,020
Pacific	9,573,187	10,322,141	11,381,594	12,552,298
NEW ENGLAND				
Maine	544,423	627,224	693,919	724,555
New Hampshire	263,524	275,764	301,514	307,551
Vermont	264,914	267,840	452,245	461,576
Massachusetts	2,498,915	2,609,127	2,751,468	3,062,418
Rhode Island	476,239	495,502	489,525	660,368
Connecticut	1,117,940	1,195,099	1,270,172	1,470,547
MIDDLE ATLANTIC				
New York	11,332,507	11,988,589	13,030,301	14,487,118
New Jersey	1,736,881	1,903,654	2,085,258	2,185,947
Pennsylvania	7,457,414	7,824,527	7,541,500	8,186,872
EAST NORTH CENTRAL				
Ohio	4,761,028	4,950,487	5,538,758	6,442,015
Indiana	1,758,435	1,864,175	1,989,495	2,546,935
Illinois	5,930,399	6,318,563	6,965,681	7,358,554
Michigan	3,392,813	3,773,928	4,346,637	4,727,348
Wisconsin	1,820,903	1,936,196	2,106,423	2,270,302
WEST NORTH CENTRAL				
Minnesota	1,040,191	1,054,094	1,065,262	1,215,187
Iowa	1,344,978	1,410,992	1,520,639	1,494,513
Missouri	912,503	958,452	990,792	1,234,287
North Dakota	47,555	56,541	85,385	104,250
South Dakota	80,342	88,121	105,887	109,358
Nebraska	394,832	431,001	464,291	538,003
Kansas	776,413	842,252	893,449	1,020,371

	Electrical Energy Generated (Thousands of Kilowatt-Hours)			
SOUTH ATLANTIC	1926	1927	1928	1929
Delaware	118,866	120,293	100,074	53,668
Maryland	578,989	602,355	1,477,025	2,014,268
Dist. of Columbia	381,373	414,393	467,206	504,220
Virginia	925,882	1,088,601	1,168,500	1,306,475
West Virginia	1,807,360	2,047,628	2,044,790	2,256,800
North Carolina	1,117,378	2,086,547	2,225,332	2,567,643
South Carolina	1,038,198	1,116,852	1,399,205	1,463,637
Georgia	710,578	709,664	981,072	1,165,788
Florida	509,670	581,742	636,576	669,859
EAST SOUTH CENTRAL				
Kentucky	513,800	566,198	625,149	715,956
Tennessee	894,015	928,592	956,094	1,009,069
Alabama	1,582,717	1,867,079	1,694,678	1,856,866
Mississippi	58,667	45,831	50,355	56,197
WEST SOUTH CENTRAL				
Arkansas	163,697	166,879	149,583	125,789
Louisiana	519,793	633,018	821,102	997,512
Oklahoma	463,128	676,019	843,794	987,353
Texas	1,492,902	1,839,466	2,220,901	2,801,112
MOUNTAIN				
Montana	1,407,903	1,394,655	1,619,351	1,627,864
Idaho	810,789	806,402	947,709	887,662
Wyoming	59,381	66,493	83,931	98,558
Colorado	561,962	551,173	541,150	563,183
New Mexico	25,993	33,462	52,326	661,694
Arizona	172,243	278,559	335,755	286,171
Utah	349,604	338,067	282,791	417,387
Nevada	36,840	51,236	54,935	43,026
PACIFIC				
Washington	1,807,792	2,121,939	2,361,024	2,563,007
Oregon	831,135	844,654	1,040,743	1,163,592
California	6,898,260	7,355,548	7,979,827	8,825,697

for size: State Line (Indiana), Deepwater (Delaware), Louisiana Power & Light station, River Bend (North Carolina), Delray No. 3 (Michigan), Gorgas No. 2 (Alabama), and Holland (New Jersey). These seven plants total 837,500 kw. To be completed in 1930 or later are such plants as Ashtabula (Ohio), Atkinson (Georgia), White River (Indiana), Michigan City (Indiana), James H. Reed (Pennsylvania, Sayreville and South Amboy (New Jersey). These seven plants will have a total initial capacity of 538,000 kw. Large additions have also been made to such well-known stations as South Meadow, Hudson Avenue, Chas. R. Huntley, East River, Hell Gate, Avon, Crawford Avenue, Zilwaukee, Philo, Cahokia, Deepwater (Texas). Station A (Pacific Gas & Electric), Long Beach No. 3 and Powerton.

At least eighteen hydro plants with an initial generating capacity of 50,000 kw. or over will be completed in 1930 or shortly thereafter. Of these, seven range from 100,000 hp. to 185,000, namely, Connecticut River, two near Columbia (S. C.) totaling 275,000 hp., Bagnell (Mo.) Fifteen-Mile Falls, Skagit River, and Table Rock (Mo.). The Calderwood (Tex.) development rated at 112,000 hp. was completed in 1929.

A number of hydro plants were started or completed under federal license in 1929. More than 2,750,000 hp. is involved, estimated to cost more than $317,000,000. Apparently the actual cost will be more, because these average only $115 per horsepower, which seems entirely too low for hydro developments. Eleven of these plants will have an initial capacity ranging from 105,000 hp. to 556,000 hp. In order of size these are on the West and North Forks of the Kings River, two on San Joaquin River, Saluda River, Skagit River, Deschutes River, Osage River, Savannah River, Pit River, South Fork of American

New Capacity Installed or Scheduled for Completion During 1929

Division	Hydro		Steam	
	Hp.	Estimated Kva.	Kw.	Estimated Kva.
New England	71,800	59,900	40,000	50,000
Middle Atlantic	18,900	15,700	446,400	557,100
South Atlantic	34,750	28,990	313,500	392,000
East North Central	22,040	18,400	814,600	1,018,100
East South Central	112,000	93,500	71,710	89,690
West North Central	0	0	153,050	191,300
West South Central	2,500	2,080	219,510	274,400
Mountain	1,500	1,250	15,000	18,750
Pacific	111,000	91,600	95,000	118,750
United States	**374,490**	**331,420**	**2,168,770**	**2,710,090**

SYSTEMS OPERATING ON PURCHASED ENERGY EXCLUSIVELY

State and Section	Private Companies Rating,		Municipal Systems Rating,		Municipal and Private Rating,	
	No.	Kva.	No.	Kva.	No.	Kva.
UNITED STATES	573	1,134,400	529	234,000	1,102	1,368,400
New England	110	284,000	43	31,500	153	315,600
Middle Atlantic	101	386,700	54	22,800	155	409,400
South Atlantic	53	56,300	93	39,100	146	95,300
East North Central	136	209,700	135	60,000	271	269,700
West North Central	69	52,300	132	17,500	201	69,800
East South Central	14	3,300	9	3,000	23	6,300
West South Central	16	4,300	19	3,600	35	7,900
Mountain	38	42,000	20	18,700	58	60,700
Pacific	36	95,800	24	37,800	60	133,600
NEW ENGLAND						
Maine	18	2,800	...	.....	18	2,800
New Hampshire	9	4,600	2	900	11	5,500
Vermont	18	9,600	6	800	24	10,400
Massachusetts	49	215,400	29	23,600	78	239,1000
Rhode Island	4	8,300	1	500	5	8,800
Connecticut	12	43,400	5	5,700	17	49,100
MIDDLE ATLANTIC						
New York	46	355,900	27	11,200	73	367,100
New Jersey	3	3,800	8	6,400	11	10,200
Pennsylvania	52	26,900	19	5,200	71	32,100
SOUTH ATLANTIC						
Delaware	...	.....	...	.....	....	.....
Maryland	7	9,600	2	100	9	9,700
District of Columbia	1	1,500	...	.....	1	1,500
Virginia	6	700	3	2,200	9	2,900
West Virginia	12	3,800	2	500	14	4,300
North Carolina	15	38,500	32	19,900	47	58,400
South Carolina	7	400	16	8,200	23	8,600
Georgia	1	100	26	6,900	27	7,000
Florida	4	1,700	12	1,300	16	3,000
EAST NORTH CENTRAL						
Ohio	47	49,600	40	14,900	87	64,400
Indiana	36	26,100	34	10,500	70	36,600

State and Section	Private Companies Rating,		Municipal Systems Rating,		Municipal and Private Rating,	
	No.	Kva	No.	Kva.	No.	Kva.
Illinois	25	119,500	7	8,600	32	128,100
Michigan	5	3,000	10	4,000	15	7,000
Wisconsin	23	11,500	44	22,100	67	33,600
WEST NORTH CENTRAL						
Minnesota	7	700	41	8,500	48	9,100
Iowa	22	25,200	28	2,600	50	27,800
Missouri	16	23,700	4	700	20	24,400
North Dakota	3	200	2	700	5	900
South Dakota	3	200	4	300	7	500
Nebraska	7	1,100	26	3,200	33	4,400
Kansas	11	1,300	27	1,400	38	2,700
EAST SOUTH CENTRAL						
Kentucky	1	100	...	.....	1	100
Tennessee	10	1,300	1	300	11	1,600
Alabama	2	1,900	7	1,200	9	3,100
Mississippi	1	50	1	1,500	2	1,500
WEST SOUTH CENTRAL						
Arkansas	4	400	...	.....	4	400
Louisiana	2	100	2	200	4	300
Oklahoma	4	300	11	900	15	1,200
Texas	6	3,500	6	2,500	12	6,000
MOUNTAIN						
Montana	4	3,700	...	.....	4	3,700
Idaho	6	2,200	6	2,300	12	4,400
Wyoming	4	2,300	3	400	7	2,700
Colorado	8	8,000	4	12,600	12	20,600
New Mexico	1	300	...	.....	1	300
Arizona	8	24,100	3	2,400	11	26,500
Utah	4	700	3	600	7	1,300
Nevada	3	800	1	400	4	1,200
PACIFIC						
Washington	14	29,400	7	4,400	21	33,800
Oregon	7	900	1	100	8	1,000
California	15	65,500	16	33,200	31	98,800

Steam-Electric Plants Completed in 1929 or Now Under Construction

Including Additions to Existing Installations

Company	Station	Initial or Added Capacity, Kw.	Scheduled Date of Operation	Ultimate Capacity, Kw.
NEW ENGLAND STATES				
Hartford Elec. Lt. Co.	South Meadow	a40,000	1929	100,000
Hudson Lt. & Pwr. Dept., Town of	Cherry Street	a460	††	3,100
MIDDLE ATLANTIC STATES				
Brooklyn Edison Co.	Hudson Ave.	a110,000	1931	a750,000
Buffalo General Elec. Co.	Charles R. Huntley	a*107,000	b	*540,000
Duquesne Lt. Co.	James H. Reed	60,000	1930	120,000
Eastern New Jersey Pwr. Co.	Sayerville	60,000	1930	180,000
Jersey Central Pwr. & Lt. Co.	South Amboy	50,000	1930	270,000
New Jersey Pwr. & Lt. Co.	Holland	55,000	1929	220,000
New York Edison Co.	East River	a160,000	1929	1,250,000
United Elec. Lt. & Pwr. Co.	Hell Gate	a160,000	1929	605,000
SOUTH ATLANTIC STATES				
Broad River Pwr. Co.	Parr Shoals	a30,000	1929	72,500
Delaware River Mfg. Co.	Deepwater	118,500	1929	400,000
Duke Pwr. Co.	River Bend	112,000	1929	450,000
Eastern Shore Pub. Serv. Co.	Exmore, Va.	a*750	1929	*1,950
Florida Pwr. Corp.	St. Petersburg	[1]18,500	1929	18,500
Georgia Pwr. Co.	Brunswick	a2,000	1930	2,000
Georgia Pwr. Co.	Atkinson (Atlanta)	*80,000	1930	*320,000
Jacksonville Munic. Elec. Plt.	Jacksonville	a25,000	††	50,000
Potomac Elec. Pwr. Co.	Benning	a30,000	1929	178,000
Rocky Mount, City of	Rocky Mt. Pub. Util.	a†5,000	1929	†16,900
EAST NORTH CENTRAL STATES				
Alliance Pwr. Co.	Alliance	a†15,000	1929	†25,000
Cleveland Elec. Illum. Co.	Avon	a35,000	1929	300,000
	Ashtabula	150,000	1930	400,000
Commonwealth Edison Co.	Crawford Ave.	a104,000	1929	.....
Consumers Pwr. Co.	Wealthy Street	a20,000	1929	42,000
	Zilwaukee	a70,000	1929	140,000
Detroit Edison Co.	Delray No. 3	100,000	1929	400,000
Hamilton Munic. Elec. Plt.	Hamilton, Ohio	a†9,350	1929	25,000
Indianapolis Pwr. & Lt. Co.	White River	70,000	1931	140,000
Moline-Rock Island Mfg. Co	Riverside, Iowa	22,500	1929	100,000
Northern Indiana Pub. Serv. Corp.	Michigan City, Ind.	68,000	1931	120,000
Ohio Pwr. Co.	Philo	a165,000	1929	400,000
State Line Elec. Co.	Hammond, Ind.	208,000	1929	1,000,000
Super Power Co. of Ill.	Powerton, Ill.	215,000	b	320,000
Toledo Edison Co.	Acme	35,000	1929	110,000
Union Elec. Lt. & Pwr. Co.	Venice	a35,000	1929	62,500
Village of Vassar Lt. & Wtr. Dept.	Vassar, Mich.	a†750	1929	†1,312
EAST SOUTH CENTRAL STATES				
Alabama Pwr. Co.	Gorgas No. 2	60,000	1929	*420,000
Dyersburg Munic. Lt. & Pwr. Plant	Dyersburg	3,000	1929	4,700
Kentucky Elec. Develop. Co.	Liberty	†45	1929	†100
Kentucky Pwr. & Lt. Co.	Carrollton	c*360	1929	.....
Munic. Lt. & Wtr. Plant	Oxford Wtr. & Lt. Plant	ca*660	1929	*1,485
Southeastern Production Co.	Mobile	8,000	1929	8,000
WEST NORTH CENTRAL STATES				
Chillicothe Lt. & Wtr. Dept.	Chillicothe	a*512	1929	.....
Crete Munic. Lt. & Wtr. Wks.	Crete, Nebr.	a*700	1929	*900
Fairmont Muni. Wtr. & L. Pl.	Fairmont	a1,000	††	.....
Iowa Pub. Serv. Co.	Waterloo	a*3,300	1929	.....
Iowa Pub. Serv. Co. [3]	Spirit Lake	c*675	1929	.....
Kansas City Munic. Elec. Pl.	Omndoro	a21,000	1930	100,000
Kansas City Pwr. & Lt. Co.	Kansas City	††a35,000	1929	60,000
Kansas Pwr. & Lt. Co.	Tecumseh	28,000	b	.....
Municipal Lt. Plant	Independence, Mo.	a2,500	1929	.....
Municipal Util Co.	Clarion, Ia.	†475	1929	.....
Municipal Util. Co.	Emmetsburg	*240	1929	*240
Nebraska Pwr. Co.	Omaha	.....	....	.....
Northern States Pwr. Co.	Granite Falls, Minn.	.....	1930	20,000
Northwestern Pub. Serv. Co.	Mitchell	5,000	1929	†16,450
Riverside Pwr. Co.	Riverside	a12,500	1929	.....
Union Elec. Lt. & Pwr. Co.	Cahokia	[2]75,000	1929	.....
Western Pub. Serv. Co.	Mound City, Mo.	da*840	1929	*840
WEST SOUTH CENTRAL STATES				
Central Pwr. & Lt. Co.	Devils River	†5,000	1930	50,000
	Victoria	a6,750	1929	.....
	La Paloma	a11,250	1929	24,250
Dallas Pwr. & Lt. Co.	Dallas	a25,000	1930	82,500
Denton Wtr. & Lt. Dept., City of	City of Denton	ca*800	1929	*4,000
El Paso Elec. Co.	Van Horn, Texas	a†105	1929	.....
	Above Courchesne Bridge	40,000	1929	150,000
Houston Lighting & Pwr. Co.	Deepwater	a50,000	1929	180,000
La. Pwr. & Lt. Co.	.....	*134,000	1929	*134,000
La. Public Util. Co.	Mansfield	†500	1929	†2,000
Okla. Gas & Elec. Co.	Belle Isle Lake	30,000	1930	30,000
	Lincoln Beerbower	15,000	1929	144,260
	Shattuck	975	1929	.....
Public Service Co. of Okla.	Weleetka	a15,000	....	.....
Purcell Munic. Lt. Plant	Purcell, Okla.	*1,000	1929	*2,000
Southwestern Gas & El. Co.	Mena, Ark.	c*437	1929	*437
	Natchez	a*1,250	1929	.....
Stillwater Municipal	Stillwater	a1,500	1929	2,500
Texas La. Pwr. Co.	Pecos, Texas	a*2,500	1929	*5,000
West Texas Util. Co.	Concho	a†20,000	1930	†32,000
MOUNTAIN STATES				
Central Ariz. Lt. & Pwr. Co.	Phoenix	15,000	1929	60,000
PACIFIC STATES				
Great Western Power Co.	San Francisco	35,000	1929	170,000
Northwestern Electric Co.	Lincoln	a25,000	1929	45,000
Pacific Gas & Elec. Co.	Station A	a100,000	1930	200,000
Portland Electric Pwr. Co.	Station L	a35,000	1930	.....
Puget Sound Pwr. & Lt. Co.	Shuffleton	35,000	1929	.....
		a35,000	1930	210,000
Southern Cal. Edison Co.	Unit 11—Long Beach No. 3	a100,000	1930	800,000

* Horsepower. † Kilovolt-amperes.

†† December 1928. a Added installation.

b Construction under way; definite date of completion not stated.

c Diesel engine installation. d Oil engine.

[1] Replaces old plant. [2] Replaces 35,000 kw. unit, moved to Venice, Ill.

[3] Succeeded by Iowa Ry. & Lt. Co.

River, and Big Pigeon River. Their total initial capacity will be 2,400,000 hp.

Canada is also conspicuous for its hydro developments started or completed in 1929. Noteworthy among them are Chute-à-Caron, Que., 260,000 hp.; Beauharnois, Que., 200,000 hp., and Seven Sisters, Manitoba, 112,500 hp.

Excluding Canadian development, there are now under construction some 6,260,000 kva. in generating stations, of which 67 per cent is in steam plants.

Hydro-Electric Plants Completed in 1929 or Now Under Construction

Including Additions to Existing Installations

Company	Station	Initial or Added Capacity, Hp.	Scheduled Date of Operation	Ultimate Capacity, Hp.
NEW ENGLAND STATES				
Central Maine Pwr. Co.	Wyman	68,000	1931	103,000
	Gulf Island	27,000	1929	27,000
Connecticut Lt. & Pwr. Co.	Rocky River	*24,000	**1929	*48,000
Grafton Pwr. Co.	Fifteen Mile Falls	*140,000	1930	200,000
New England Pwr. Assn.	Connecticut River	185,000	1930	185,000
Rockland Lt. & Pwr. Co.	Swinging Bridge	7,000	1929	.....
Springfield, City of	Cobble Mountain	*23,000	1930	*23,000
Twin States Gas & Elec. Co.	Arnold Falls	*500	**1929	500
	No. 4	*700	1929	*700
MIDDLE ATLANTIC STATES				
Lamoka Pwr. Corp. [1]	Lake Seneca	20,000	1931	20,000
	Lake Keuka	3,200	**1929	20,000
	Lake Lamoka	2,500	**1929	2,500
Malone Lt. & Pwr. Co.	St. Regis River	1,200	1929	.....
New York Pwr. & Lt. Corp.	Conklingville	.....	1929	.....
Niagara, Lockport & Ont. Pwr. Corp.	Lighthouse Hill	10,000	1930	10,000
Northern New York Util. Inc.	Mosher Falls	12,000	**1929	24,000
SOUTH ATLANTIC STATES				
Carolina Pwr. & Lt. Co.	Waterville	50,000	1931	225,000
General Gas & Elec. Co.	Near Columbia, S.C.	100,000	1930	100,000
Georgia Pwr. Co.	4 mi. N. of Milledgeville	60,000	1931	60,000
Hydro-Elec. Corp. of Va.	James River	7,000	1929	7,000
Lexington Wtr. Pwr. Co.	10 miles from Columbia, S. C.	175,000	1930	260,000
Nantahala Pwr. & Lt. Co.	Nantahala	†45,000	1933	†45,000
Richmond Munic.	Hollywood	.....	1930	.....
Roanoke River Pwr. Co.	Buggs Island	9,400	1930	80,000
Stock Co. of Bull Run, Va.	Clifton Station	500	**1929	500
Virginia-Carolina Pwr. Co. [2]	Near Roanoke Rap's	13,800	*b*	87,000
Virginia Elec. & Pwr. Co.	Boyd's Mill	*25,000	1931	30,000
	Near Boydton, Va.	50,000	1930	130,000
Virginia Pub. Serv. Co.	Snowden	*7,500	1929	7,500
West Florida Pwr. Corp.	Jackson Bluff	16,000	**1929	16,000
EAST NORTH CENTRAL STATES				
Consumers Pwr. Co.	Oxbow	40,000	1931	40,000
Lake Superior Dist. Pwr. Co.	Thornapple Dam	†1,700	**1929	†1,700
	Port Arthur	†200	*b*	†2,000
	Ladysmith	†125	*b*	†2,000
Wisconsin Pwr. & Lt. Co.	Indian Ford	20,000	**1929	20,000
EAST SOUTH CENTRAL STATES				
Alabama Pwr. Co.	Lower Tallassee	50,000	1930	120,000
Holston River Pwr. Co.	Above Kingston	.....	*b*	.....
Knoxville Pwr. Co.	Calderwood	112,000	1929	168,000
Louisville Gas & Elec. Co.	Third Street and Ohio River	2,500	....	2,500
Tennessee Eastern Elec. Co.	Hemlock Dam	40,000	1933	40,000
Toccoa Pwr. Co.	Near Blue Ridge, Va.	20,000	1931	20,000
WEST NORTH CENTRAL STATES				
Black River Hydro-Elec. Pwr. Co.	So. of Piedmont, Mo.	10,000	1930	30,000
Central States Pwr. & Lt. Co.	Niangua River	.....	*b*	4,000
Empire District Elec. Co.	Table Rock	100,000	1931	100,000
Peoples Gas & Elec. Co.	Mason City	*a*10,000	....	.....
Union Elec. Lt. & Pwr. Co.	Near Bagnell, Mo.	160,000	1931	215,000
WEST SOUTH CENTRAL STATES				
Arkansas Pwr. & Lt. Co.	Ola, Couch Dam	††12,000	1936	96,000
	Carpenter	53,3†3	*b*	53,333
Central Pwr. & Lt. Co.	Lake Walk	*a*2,500	1929	.....
	Devils River	60,000	1931	60,000
	Presidio, Texas	†8,700	*b*	.....
West Texas Util. Co.	Near Abilene, Texas	60,000	1930	60,000
MOUNTAIN STATES				
Dixie Pwr. Co.	No. 4	*1,000	1929	*1,000
Montana Pwr. Co.	Morony	*50,000	1930	50,000
Public Serv. Co. of Colorado.	Salida No. 1	*750	1930	1,150
Salt River Valley Wtr. Users' Assn.	Stewart, Mt	*10,000	1930	10,000
U. S. Bureau of Reclamation	Shoshone	*a*4,000	1930	5,600
PACIFIC STATES				
Eugene, Oregon, City of	Leaburg	*6,000	1929	*12,000
Inland Pwr. & Lt. Co.	Arill	*40,000	1930 or 1931	*160,000
	Joseph	*1,000	1929	*1,000
Pacific Gas & Elec. Co.	Salt Springs	*9,000	1931	*28,000
	Spaulding No. 3	*5,600	1929	*5,600
	Tiger Creek	*50,000	1931	*50,000
Portland Elec. Pwr. Co.	Oak Grove	*a*25,000	1930	*75,000
Seattle, City of	Gorge Plant	*a*26,400	1929	*240,000
	Skagit Gorge and Diablo Canyon [3]	†120,000	1931	[4]480,000
San Joaquin Lt. & Pwr. Corp.	Merced Falls	*3,440	1930	*3,440
Southern California Edison Co.	Big Creek No. 8	*a*35,000	1929	*55,500
Tacoma, City of	Cushman No. 2	54,000	1930	*81,000

*Kilowatts. **Completed. ‡Replaced Unit.
†Kilovolt-amperes. ††Prior to 1929. *a*Added installation.

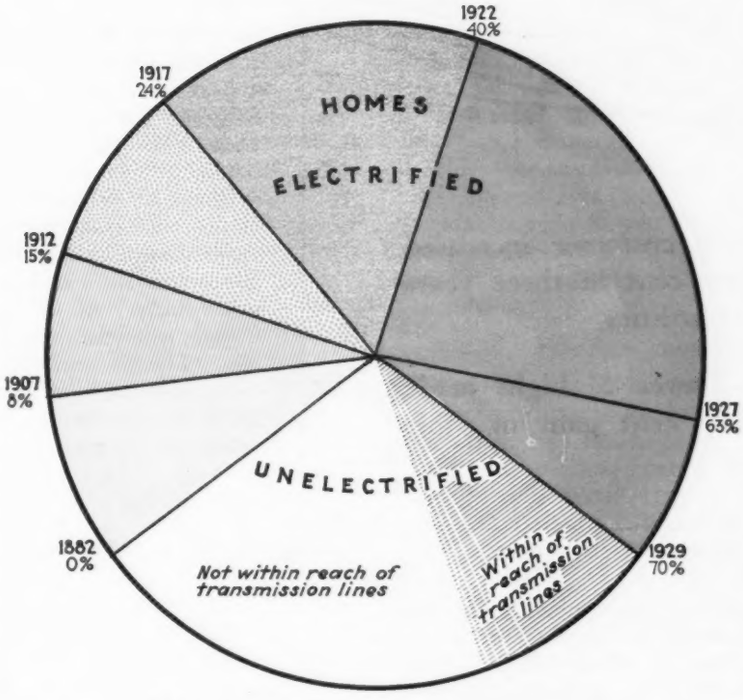
b Construction under way; definite date of completion not stated.
[1] For N. Y. Central Pwr. Corp. [2] Sold to Virginia Elec. & Pwr. Co.
[3] Diablo Canyon. [4] Kva. at 40% load factor.

Central Station Customers

	Total Number				Domestic Lighting				Commercial Lighting				Power and Miscellaneous			
	1927	1928	1929	Increase in 1929	1927	1928	1929	Increase in 1929	1927	1928	1929	Increase in 1929	1927	1928	1929	Increase in 1929
UNITED STATES	21,790,238	23,184,781	24,257,159	1,072,378	17,698,024	18,833,970	19,721,486	887,516	3,159,214	3,329,939	3,456,434	126,495	933,000	1,020,872	1,079,239	58,367
New England	2,007,649	2,106,852	2,191,730	84,878	1,657,198	1,745,416	1,823,152	77,736	272,357	280,370	286,165	5,795	78,094	81,066	82,413	1,347
Middle Atlantic	6,033,547	6,610,798	6,908,768	297,970	4,855,004	5,340,253	5,597,913	256,940	977,050	1,048,001	1,079,601	31,600	201,383	222,544	231,974	9,430
East North Central	5,313,705	5,577,360	5,836,530	259,170	4,424,151	4,632,759	4,856,059	223,300	691,046	721,292	749,062	27,770	198,508	223,309	231,409	8,100
West North Central	2,188,623	2,264,650	2,351,730	87,080	1,770,789	1,832,524	1,902,024	69,500	311,760	319,313	327,083	7,770	106,074	112,813	122,623	9,810
South Atlantic	1,564,711	1,647,239	1,739,979	92,740	1,260,116	1,326,079	1,401,449	75,370	240,970	250,328	264,818	14,490	63,625	70,832	73,712	2,880
East South Central	721,576	770,851	812,181	41,330	564,770	600,256	632,496	32,240	123,058	132,232	138,212	5,980	33,748	38,363	41,473	3,110
West South Central	1,133,458	1,225,847	1,295,567	69,720	856,489	924,392	974,092	49,700	217,707	235,370	251,410	16,040	59,262	66,085	70,065	3,980
Mountain	597,576	626,007	650,267	24,260	489,399	511,601	530,321	18,720	84,669	89,173	93,043	3,870	23,508	25,233	26,903	1,670
Pacific	2,229,503	2,355,177	2,470,407	115,230	1,820,108	1,920,690	2,004,700	84,010	240,597	252,860	267,040	13,180	168,798	180,627	198,667	18,040
NEW ENGLAND																
Maine	184,924	171,131	178,149	7,018	146,998	135,512	140,868	5,356	27,610	25,846	26,961	1,115	10,316	9,773	10,320	547
New Hampshire	106,279	123,690	123,890	200	84,000	97,020	98,010	990	18,025	22,020	22,070	50	4,224	4,650	3,810	—840
Vermont	76,235	90,916	93,116	2,200	62,500	75,036	77,516	2,480	8,620	9,950	9,720	—230	5,115	5,930	5,880	— 50
Massachusetts	1,078,007	1,124,183	1,177,693	53,510	895,000	937,734	987,804	50,070	142,007	144,260	146,140	1,880	41,000	42,189	43,749	1,560
Rhode Island	169,189	179,870	184,220	4,350	141,695	151,305	153,135	1,830	22,895	23,685	26,105	2,420	4,599	4,880	4,980	100
Connecticut	393,045	417,062	434,662	17,600	327,005	348,809	365,819	17,010	53,200	54,609	55,169	560	12,840	13,644	13,674	30
MIDDLE ATLANTIC																
New York	3,194,004	3,399,903	3,569,523	169,620	2,520,004	2,698,803	2,837,723	138,920	573,000	597,800	628,300	30,500	101,000	103,300	103,500	200
New Jersey	981,040	1,104,231	1,174,181	69,950	804,000	900,450	962,110	61,660	139,000	155,531	164,221	8,690	38,040	48,250	47,850	—400
Pennsylvania	1,858,393	2,106,664	2,165,064	58,400	1,531,000	1,741,000	1,797,360	56,360	265,050	294,670	287,080	—7,590	62,343	70,994	80,624	9,630
EAST NORTH CENTRAL																
Ohio	1,370,823	1,469,528	1,550,668	81,140	1,162,020	1,247,290	1,318,790	71,500	169,403	180,978	187,878	6,900	39,400	41,260	44,000	2,740
Indiana	638,727	650,313	672,173	21,860	538,707	546,480	566,280	19,800	77,420	79,790	81,700	1,910	22,600	24,043	24,193	150
Illinois	1,766,926	1,810,000	1,874,690	64,690	61,220	1,496,900	1,555,200	58,300	235,200	242,684	250,284	7,600	70,506	70,416	69,206	— 1,210
Michigan	981,606	1,052,933	1,111,973	—59,040	827,004	889,473	939,633	50,160	128,800	135,870	143,130	7,260	25,802	27,590	29,210	1,620
Wisconsin	555,623	594,586	627,026	32,440	435,200	452,616	476,156	23,540	80,223	81,970	86,070	4,100	40,200	60,000	64,800	4,800
WEST NORTH CENTRAL																
Minnesota	453,990	464,190	474,210	10,020	366,740	375,050	382,820	7,770	68,400	69,750	70,890	1,140	18,850	19,390	20,500	1,110
Iowa	439,473	450,500	470,060	19,560	354,300	361,486	378,676	171,190	59,988	60,726	62,396	1,670	25,185	28,288	28,988	700
Missouri	620,113	644,750	666,710	21,960	496,358	518,232	534,972	16,740	96,895	98,260	99,410	1,150	26,860	28,258	32,328	4,070
North Dakota	60,540	61,640	66,290	4,650	47,543	48,443	51,813	3,370	9,332	9,462	10,362	900	3,665	3,735	4,115	380
South Dakota	79,757	83,540	87,010	3,470	62,148	64,500	66,780	2,280	12,985	13,828	14,528	700	4,624	5,212	5,702	490
Nebraska	221,872	233,930	245,810	11,880	181,225	191,690	201,770	10,080	31,160	32,308	32,808	600	9,487	9,932	11,232	1,300
Kansas	312,878	326,100	341,640	15,540	262,475	273,123	285,193	12,070	33,000	34,979	36,689	1,710	17,403	17,998	19,758	1,760
SOUTH ATLANTIC																
Delaware	33,665	36,300	38,490	2,190	26,481	28,886	30,516	1,630	6,222	6,402	6,712	310	962	1,012	1,262	250
Maryland	271,550	276,147	292,257	16,110	233,790	237,967	253,617	15,650	32,960	33,250	33,490	240	4,800	4,930	5,150	220
Dist. of Columbia	120,839	125,614	133,854	8,240	98,439	102,224	111,344	9,120	16,850	17,355	16,495	—860	5,550	6,035	6,015	—20
Virginia	211,011	235,326	250,246	14,920	176,501	197,096	210,486	13,390	25,200	27,611	31,231	3,620	9,310	10,619	8,529	—2,090
West Virginia	156,687	169,330	185,680	16,350	124,240	134,610	148,130	13,520	27,205	28,840	31,160	2,320	5,242	5,880	6,390	510
North Carolina	220,071	234,781	249,021	14,240	169,271	179,856	191,206	11,350	40,800	43,799	45,909	2,110	10,000	11,126	11,906	780
South Carolina	94,664	99,261	105,311	6,050	74,244	77,745	81,565	3,820	17,260	18,070	20,230	2,160	3,160	3,446	3,516	70
Georgia	196,256	241,420	225,990	11,570	157,920	169,920	178,390	8,470	30,596	34,100	36,400	2,300	7,740	10,400	11,200	800
Florida	259,968	256,060	259,130	3,070	199,200	197,775	196,195	—1,580	43,868	40,901	43,191	2,290	16,900	17,384	19,744	2,360
EAST SOUTH CENTRAL																
Kentucky	247,965	264,900	278,980	14,080	195,000	208,540	221,860	13,320	42,000	44,934	46,594	1,660	10,965	11,426	10,526	—900
Tennessee	227,592	232,000	245,250	13,250	177,300	183,566	194,386	10,820	37,442	38,978	40,818	1,840	8,850	9,456	10,046	590
Alabama	170,394	182,991	192,591	9,600	131,230	140,310	145,820	5,510	29,200	30,435	32,015	1,580	9,964	12,246	14,756	2,510
Mississippi	79,625	90,960	95,360	4,400	61,240	67,840	70,430	2,590	14,416	17,885	18,785	900	3,969	5,235	6,145	910
WEST SOUTH CENTRAL																
Arkansas	115,282	123,492	128,622	5,130	91,382	97,152	100,022	2,870	19,950	21,570	23,390	1,820	3,950	4,770	5,210	440
Louisiana	168,827	176,805	183,795	6,990	129,325	135,740	140,720	4,980	32,252	33,190	34,720	1,530	7,250	7,875	8,355	480
Oklahoma	239,892	260,000	279,900	19,900	186,630	201,250	216,560	15,310	40,000	43,940	47,210	3,270	13,262	14,810	16,130	1,320
Texas	609,457	655,550	703,250	37,700	449,152	490,250	516,790	26,540	125,505	136,670	146,090	9,420	34,800	38,630	40,370	1,740
MOUNTAIN																
Montana	80,919	85,812	90,002	4,190	64,130	67,922	71,302	3,380	12,825	13,428	13,888	460	3,964	4,462	4,812	350
Idaho	78,506	79,783	83,743	3,960	62,400	62,014	66,124	3,110	13,700	14,226	14,926	700	2,406	2,543	2,693	150
Wyoming	31,014	31,685	32,795	1,110	26,600	27,134	28,084	950	3,131	3,213	3,323	110	1,283	1,338	1,388	50
Colorado	197,263	198,004	200,354	2,350	161,700	161,996	163,436	1,440	28,055	28,315	28,805	490	7,508	7,693	8,113	420
New Mexico	27,214	28,854	30,674	1,820	22,658	24,035	25,115	1,080	3,449	3,662	4,092	430	1,107	1,157	1,467	310
Arizona	54,112	59,301	64,591	5,290	44,420	48,552	52,872	4,320	7,052	7,783	8,483	700	2,640	2,966	3,236	270
Utah	112,965	125,568	129,998	4,430	95,486	105,882	109,472	3,590	13,297	15,087	15,837	750	4,182	4,599	4,689	90
Nevada	15,583	17,000	18,110	1,110	12,005	13,066	13,916	850	3,160	3,459	3,689	230	418	475	505	30
PACIFIC																
Washington	392,709	440,897	465,067	24,170	338,605	380,000	400,080	20,080	43,954	49,030	52,500	3,470	10,150	11,867	12,487	620
Oregon	209,078	216,680	226,500	9,820	181,000	187,420	196,270	8,850	19,078	19,670	20,250	580	9,000	9,590	9,980	390
California	1,627,716	1,697,600	71,78,840	81,240	1,200,503	1,353,270	1,408,350	55,080	177,565	118,560	194,290	9,130	149,648	159,170	176,200	17,030

Another Million Customers

Total stands at 24,257,160. The year's addition was 1,072,380. Seven homes in ten are now served



Threefold increase in customers in twelve years

LIKE other records of the electrical industry, the statistics on the number of customers tell a story of continued and rapid expansion. The total number at the end of 1929 stands at 24,257,160; of these 19,721,490 are residential, 3,456,430 are served for commercial lighting and small power, 1,079,240 use energy either as large power customers or for various miscellaneous purposes in neither of the first two categories.

The end of 1929 finds 887,520 more customers in the first group than there were at the beginning of the year, 126,500 more in the second and 58,370 in the third. A perfectly accurate segregation between these groups is impossible. That here given is as close as can be made; minor variations in classification are found from year to year in returns for the same company, but their effect is negligible in the general picture.

Statistics by states appear in the accompanying table for the past three years. The long-time summary for the country will be found in the table of "outstanding facts" on page 10 of this issue.

Several important conclusions may be drawn from the figures presented. Four customers out of five are residential. One in seven has commercial lighting. Only 4 per cent are in the power and miscellaneous group. The proportionate amounts of energy consumed and of revenue are of course entirely different.

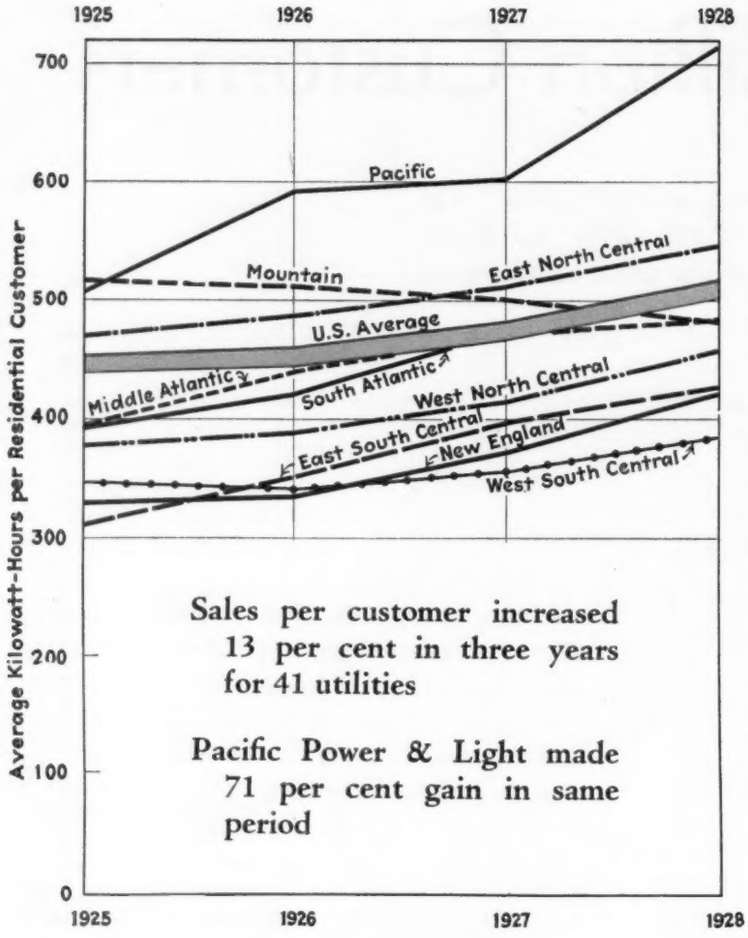
The increase, though large, is smaller than last year, and the ratio of increase is less than that of output or revenue; it amounts to 5.0 per cent. This, again, is in line with past history. Seventy per cent of America's homes are now wired. The others are chiefly on farms or in very small, isolated communities. In urban centers the unwired home has become a rarity.

Starting at the birth of the industry, in 1882, the number of customers increased at first slowly, then more and more rapidly. The greatest gains came about 1923. At that time half the people were living in homes having electric service. There was still an equal number of potential customers, plus the increase corresponding to the growth in population. Many of these have meanwhile been reached. The number that can possibly be added is smaller each year. The bend in the growth curve is therefore normal and entirely in accord with past predictions.

Services are being consolidated. The single meter and a suitable rate structure are obviously replacing the two-meter system. The movement appears to be widespread. At least it is difficult to put any other interpretation on the returns, for in a remarkably large number of instances the reports received from power companies show a diminution—often a radical diminution—in either "power" or "other" customers, while the increase in residential and commercial is normal.

Entire states were affected to such an extent that instead of an increase from 1928 we find decreases, indicated in the table by minus signs, in the final column of the table. This happened in seven states. In others the gain in "power and miscellaneous" customers was smaller than usual, and for the whole country it was only two-thirds as great in 1929 as in 1928.

This can hardly be taken to indicate any real statewide or nation-wide losses of customers. There is too



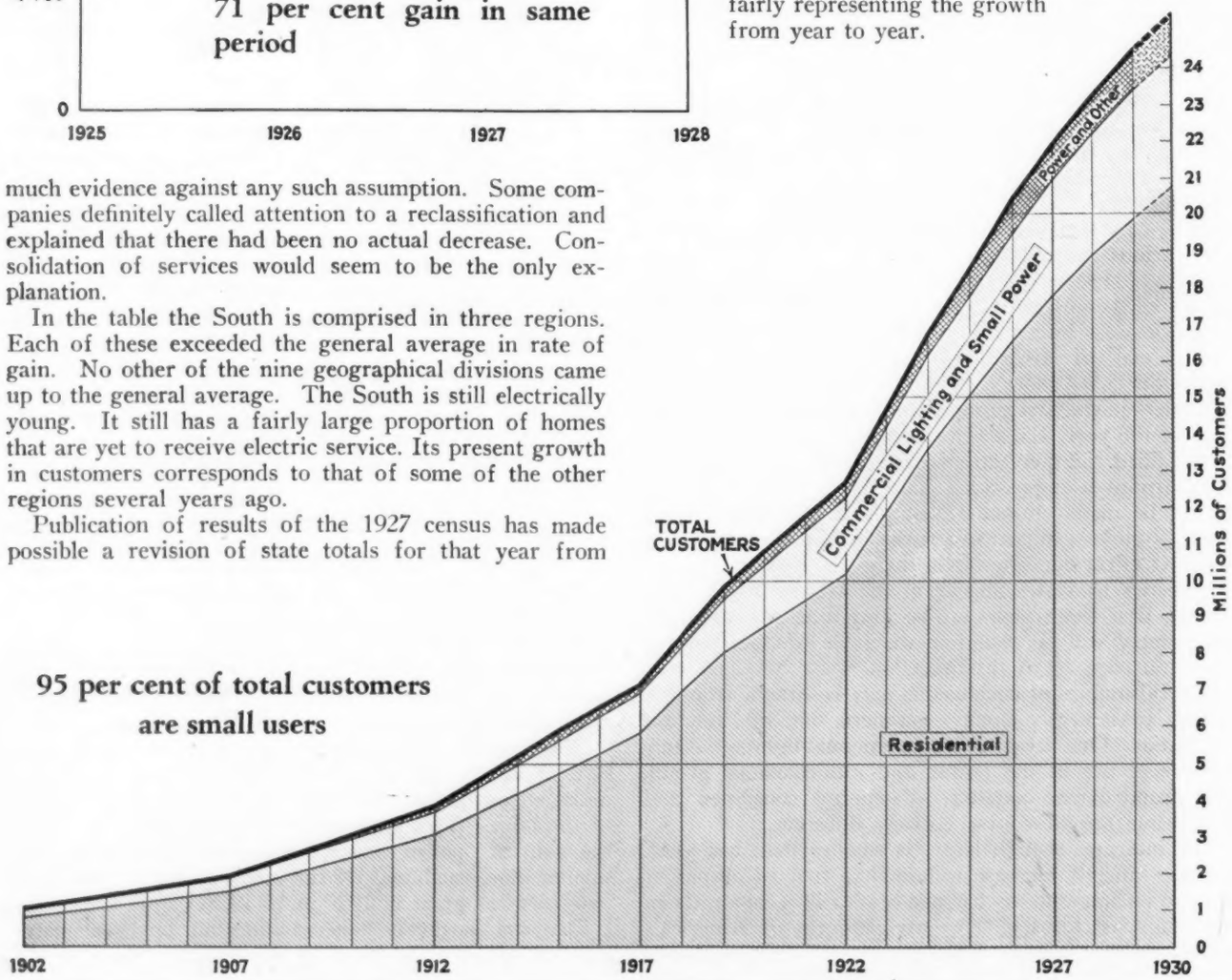
much evidence against any such assumption. Some companies definitely called attention to a reclassification and explained that there had been no actual decrease. Consolidation of services would seem to be the only explanation.

In the table the South is comprised in three regions. Each of these exceeded the general average in rate of gain. No other of the nine geographical divisions came up to the general average. The South is still electrically young. It still has a fairly large proportion of homes that are yet to receive electric service. Its present growth in customers corresponds to that of some of the other regions several years ago.

Publication of results of the 1927 census has made possible a revision of state totals for that year from those published in the ELECTRICAL WORLD a year ago. With one exception the changes are slight. New York is brought back virtually to the figure computed two years ago, and later revised upward by about 300,000 to conform to statistics collected by the state but in turn revised, finally conforming nearly with the original estimate and with the census.

For 1928 about 80 per cent of the total number were obtained through the co-operation of state utilities commissions which were able to furnish data that were either complete or that covered all but the municipal systems.

The use of these state statistics introduces some minor discrepancies. Thus in Maine the total for 1927 was about 17,000 greater than the census figure for the same year. The difference naturally affects the apparent gain in 1928. In New York the state figure was about 50,000 below, in New Jersey 5,000 below, and in Pennsylvania 35,000 below the census. In these four states the transition involves an apparently smaller gain, by 83,000, in 1928 than what actually occurred. Small differences also appear in other states. All this is to be expected, in some degree, when data are collected by different agencies. The net result for the United States, however, is almost negligible, the data presented fairly representing the growth from year to year.



Consolidations Continue

Purchases and mergers have passed peak. Several types of holding and investment organizations perfected. Major activities reviewed

FOR SOME years the light and power industry occupied itself with the development of two major economic principles. One was the formation of a holding company that would own properties in different territories so as to get diversity and stability. The second was to develop comparatively large properties in each area to take full advantage of the economic possibilities of supplying a diversified load area by means of hydro and steam stations of sufficient size to be economical. During 1929 these two trends continued.

During the past few years each local property has enlarged its scope of service by buying adjacent small properties or by extending its transmission system to outlying towns. This trend continued in 1929 and is noticeable in the West and in the South. But the peak of this movement has passed and possibilities for local expansion are rather limited.

In the operating holding company group the Associated Gas & Electric Company is typical of the type of company that buys properties in all parts of the country to get diversity in holdings and stability in earnings. Most of the properties are small that remain available on the market and there is little doubt that this type of expansion or acquisition will decrease in magnitude. In each region, however, existing holding company subsidiaries purchased local properties in the territories. Active in this direction were the Insull interests in Maine, the International Hydro-Electric System in Massachusetts, New Hampshire and Rhode Island, the Associated Gas & Electric Company in New York, the Georgia Power Company in Georgia, the Southern Public Utilities Company in North Carolina, the Interstate Public Service Company in Indiana, the Wisconsin Power & Light Company in Wisconsin, the Tennessee Central Service Company, in Tennessee and several companies in Nebraska, Oklahoma and Texas. The properties added were small towns and municipal plants.

In the operating holding company type of organization there was an active year of readjustment and consolidation. One of the large groupings was the formation of the Commonwealth & Southern Corporation that brought three strong holding companies together. Another was the merging of the Barstow interests with those of the Associated Gas & Electric Company, and great interest was excited by the formation of the Niagara Hudson Power Corporation. These consolidations were formed largely under banker auspices and were economic steps to get stability in earnings and economies in financing.

Few new companies formed

Very few new holding companies came into the field to buy properties and the future should witness a decrease rather than an increase in the number of holding companies that own and operate properties.

Several investment type of holding companies were very active during 1929. Most of these buy minority stock interests in operating and holding company groups and are largely financial only. Eventually some of them may be the agency under which several holding companies are merged, but at present, and especially since the market crash, they are interested chiefly in security buying and selling. Typical units in this group are Insull Utility Investments, Inc., United Corporation, United States Electric Power Corporation and Electric Shareholdings Corporation.

Investments and purchases of foreign properties were features of 1929 and prospects are bright for a big overseas utility growth backed by American capital and with American principles of construction and operation. Apparently 1930 in this country will be quiet in so far as large mergers and major purchases are concerned, at least until markets improve and money is available at low rates.

HOLDING COMPANY MERGERS 1929

For key and notes see page 54

Acquiring Company and Company Involved	*Holding Company*
ALLIED PWR. & LT. CORP.	
1 American Superpower Corp.	1a
1 Commonwealth & Southern Corp.	1a
1 Niagara Hudson Power Corp.	1a
Stevens & Wood, Inc.	1a
AMERICAN COMMONWEALTH PWR. CORP.	
American States Securities Corp.	..
AMERICAN & FOREIGN PWR. CORP.	
International Utilities Co.	..
AMERICAN PWR. & LT. CO.	
Stevens County Pub. Serv. Co. (24)	30
AMERICAN SUPERPOWER CORP.	
11 Italian Superpower Corp.	..
Utility Shares Corp.	..
ASSOCIATED GAS & ELEC. CO.	
Barstow & Co., W. S.	82
General Gas & Elec. Corp.	82
Rochester Central Pwr. Corp.	82
United Gas & Elec. Co. (10)	82
United Gas & Elec. Corp. (10)	82
United Gas Improvement Co., holdings in General Gas & Elec. Co.	82
ATLANTIC PUB. UTILS., INC.	
Central Atlantic Wtr. Wks. & Elec. Corp. (21)	18
North American Wtr. Wks. & Elec. Co.	18
CENTRAL STATES ELEC. CORP.	
American Cities Pwr. & Lt. Corp.	..
COMMONWEALTH & SOUTHERN CORP.	
**Commonwealth Pwr. Corp.	9–14
Penn-Ohio Edison Co.	9–14
**Southeastern Pwr. & Lt. Co.	9–14
CONNECTICUT ELEC. SECURITIES CO.	
Connecticut Elec. Service Co.	..

HOLDING COMPANY MERGERS 1929 (Continued)

Acquiring Company and Company Involved	*Holding Company*
DELAWARE ELEC. PWR. CO.	
Delaware Pub. Serv. Co.	72
ELECTRIC BOND & SHARE CO.	
Electric Bond & Share Securities Corp.	..
ELECTRIC SHAREHOLDINGS CORP.	
1 Commonwealth Pwr. Corp.	17–38
1 Consolidated Gas Co. of N. Y.	17–38
1 Middle West Utils. Co.	17–38
1 North American Co.	17–38
1 Northern States Pwr. Co.	17–38
1 Southeastern Pwr. & Lt. Co.	17–38
1 United Gas Improvement Co.	17–38
EMPIRE CORP.	
Empire Pub. Serv. Corp.	..
EMPIRE PUB. SERV. CORP.	
Electric Pub. Serv. Co. (19)	31a
Electric Pub. Utils. Co.	31a
Southwest Utils. Corp.	31a
INSULL UTIL. INVESTMENTS, INC.	
Insull, Son & Co., Inc.	..
Insull, Son & Co., Ltd. of London	..
INTERNATIONAL HYDRO-ELEC. SYS.	
Bellows Falls Pwr. Co. (6)	42
Canadian Hydro-Elec. Corp., Ltd.	42
New England Pwr. Assn.	42
Rhode Island Pub. Serv. Co. (6)	42
LANGLEY & CO.—SANDERSON & PORTER	
‡Electric Pwr. Associates, Inc.	..
LOEB & SHAW, INC.	
Albert Emanuel Co., Inc.	57
MIDDLE WEST UTILS. CO.	
United Pub. Serv. Co.	..
MIDLAND UTILS. INVESTMENT CO.	
American Pub. Utils. Co., holdings in Middle West Utils.	45
Union City Elec. Co.	45
NATIONAL ELEC. PWR. CO.	
Seaboard Pub. Serv. Co. (22)	44
NIAGARA-HUDSON PWR. CORP.	
Buffalo Niagara & Eastern Pwr. Corp.	14–26a–50
Mohawk, Hudson Pwr. Corp.	14–26a–50
Northeastern Pwr. Corp.	14–26a–50
NORTH AMERICAN GAS & ELEC. CO.	
United States Elec. Pwr. Corp.	56
NORTH AMERICAN WTR. WKS. & ELEC. CO.	
Eastern Carolina Serv. Co.	13
Keystone Wtr. Wks. & Elec. Corp.	13
Maine State Wtr. & Elec. Co.	13
North American Wtr. Wks. Corp.	13
PAN AMERICAN UTILS., INC.	
‡Canadian Wtr. Wks. & Elec. Co.	..
PARKER & CO., C. D.	
‡Seaboard Utils. Shares Corp.	..
PENN-OHIO EDISON CO.	
Northern Ohio Pwr. Co.	23a
Penn-Ohio Securities Corp.	23a
SEABOARD PUBLIC SERVICE CO.	
Eastern Shores Pub. Serv. Co.	44
STANDARD OIL CO. OF CALIF.	
Pacific Pub. Serv. Co.	..
UNION ELEX. LT. & PWR. CO.	
East St. Louis & Suburban Co.	55
UNITED CORP.	
1 Allied Pwr. & Lt. Corp. (Delaware).	14–26a–50
1 American & Foreign Pwr. Co.	14–26a–50
1 American Gas & Elec. Co.	14–26a–50
1 American Pwr. & Lt. Co.	14–26a–50
1 American Superpower Corp.	14–26a–50
1 Cities Service Co.	14–26a–50
1 Columbia Gas & Elec. Corp.	14–26a–50
1 Commonwealth Pwr. Corp.	14–26a–50
1 Commonwealth & Southern Corp.	14–26a–50
1 Italian Superpower Corp.	14–26a–50
1 Mohawk Hudson Pwr. Corp.	14–26a–50
1 National Pwr. & Lt. Co.	14–26a–50
1 Niagara-Hudson Pwr. Corp.	14–26a–50
1 Penn-Ohio Edison Co.	14–26a–50
1 Public Serv. Corp. of N. J.	14–26a–50
1 Southeastern Pwr. & Lt. Co.	14–26a–50
1 United Gas Improvement Co.	14–26a–50
1 United Lt. & Pwr. Co.	14–26a–59
1 Utilities Shares Corp.	14–26a–50
UNITED GAS IMPROVEMENT CO.	
Commonwealth Util. Corp.	..
1 General Gas & Electric Corp.	..
UNITED PWR., GAS & WTR. ASSN.	
Federal Wtr. Serv. Corp.	..
General Pwr. & Lt. Co. (4)	..
Imperial Valley Elec. Pwr. Co. (4)	..
Peoples Lt. & Pwr. Corp.	..
UNITED STATES ELEX. PWR. CORP.	
Minority interests in a group formed by Harris, Forbes Corp. and other bankers.	..
UTILITIES PWR. & LT. CORP.	
Greater London & Counties Trust Ltd.	.

KEY TO HOLDING COMPANIES

1 Albertson Co., W. N.
1a Allied Pwr. & Lt. Co. △ (3, 23, 61)
2 American Commonwealth Pwr. Corp.
3 American Elec. Pwr. Corp. (1a)
4 American & Foreign Pwr. Co. (30)
5 American & Foreign Pwr. Corp.
6 American Gas & Electric Co.
7 American Pwr. & Lt. Co. (30)
8 American Pub. Utils.
8a American States Pub. Serv. Co.
9 American Superpower Corp.
10 American Utils. Co. (40)
11 American Wtr. Wks. & Elec. Co., Inc.
11a Associated Elec. Co.
12 Associated Gas & Elec. Co. (49, 82)
13 Atlantic Pub. Utils. Inc. (18)
13a Barstow, W. S. △ (35)
14 Bonbright & Co. ■ (54, 71)
14a British Columbia Pwr. Corp.
15 Byllesby Engr. & Management Corp. △ (66, 68)
16 Central Pub. Serv. Co.
17 Central States Elec. Corp.
18 Chase & Gilbert, Inc. △ (13)
19 Cities Service Co. (29)
20 Colonial Utils. Corp.
21 Columbia Gas & Elec. Corp.
21a Columbus Elec. & Pwr. Co. O (68)
22 Commonwealth Lt. & Pwr. Co. (39)
23 Commonwealth Pwr. Corp. (23a)
23a Commonwealth & Southern Corp. (9–14, 23, 61, 64c)
24 Commonwealth Utils. Corp.
25 Connecticut Electric Securities Co.
26 Consolidated Gas Co. of New York
26a Drexel & Co. ■ 54, 71)
27 Duke Pwr. Co. O
28 East Coast Utils. Co.
28a Eastern Texas Elec. Co.
29 Eastern Utils. Assn. (19)
30 Electric Bond & Share Co. △ (4, 7, 31, 51)
30a Electric Pwr. Assocs.., Inc.
31 Electric Pwr. & Lt. Corp. (30)
31a Empire Corp. (32)
32 Empire Pub. Serv. Corp. (4, 31, 31a)
32a Engineer's Pub. Serv. Corp. (68, 69)
33 Federal Pub. Serv. Corp.
34 Foshay Co., W. B.
35 General Gas & Elec. Corp. (13a)
36 General Wtr. Wks. & Elec. Corp.
37 Glidden, Morris & Co.
38 Hydro-Electric Securities Corp.
39 Insull Son & Co., Inc. (22–44)
40 Insull Utils. Investment, Inc.
41 International Paper Co. (53)
42 International Paper & Pwr. Co.
43 McGraw Elec. Co.
44 Middle West Utils Co. (39)
45 Midland United Co. (Formerly Midland Utils. Investment Co.)
46 Midland Utils. Co.
47 Minnesota Northern Pwr. Co.
48 Mohawk Hudson Pwr. Co.
49 Mohawk Valley Co. (12)
50 Morgan & Co., J. P. ■ (54, 71)
51 National Pwr. & Lt. Co. (30)
52 New England Gas & Elec. Assn. (82)
53 New England Pwr. Assn. (41)
53a New Hampshire Pub. Serv. Commission
54 Niagara Hudson Pwr. Corp. (14–26a–50)
55 North American Co.
56 North American Elec. Pwr. Corp.
57 North American Gas & Elec. Co.
58 North American Lt. & Pwr. Co.
59 Northeastern Pwr. Corp.
60 Otter Tail Pwr. Co. (Delaware)
60a Pan American Utils., Inc.
61 Penn-Ohio Edison Co. (23a)
62 Peoples Lt. & Pwr. Corp. (75a)
62a Power Corp. of Canada
63 Public Utils. Holding Corp.
63a Royal Securities Corp.
63b Shawinigan Wtr. & Pwr. Co.
64 Seaboard Utils. Shares Corp.
64b Sierra Pacific Elec. Co. (68)
64c Southeastern Pwr. & Lt. Co. (23a)
65 Southern Cities Utils. Co.
66 Standard Gas & Electric Co. (15)
67 Standard Oil Co. of California
68 Stone & Webster, Inc. △ (15, 21a, 32a, 64b)
69 Tennessee Central Serv. Co. (32a)
70 Union Pwr. Corp.
71 United Corp. (14–26a–50)
72 United Gas Improvement Co.
73 United Lt. & Pwr. Co.
74 United Pwr., Gas & Wtr. Assn.
75 United Pub. Serv. Co.
75a United Pwr., Gas & Wtr. Corp. (62)
75b United States Elec. Pwr. Corp.
76 United States Engineering Corp.
77 United Utils. & Serv. Corp.
77a Utilities Pwr. & Lt. Corp.
78 Utilities Serv. Co.
79 Western Massachusetts Comp's.
80 Western Pwr., Lt. & Telephone Co.
81 Western United Corp.
82 The J. G. White Management Corp. △ (12)

SYMBOLS AND NOTES

** 40% Common stock (working control)
1 Minority interest
11 50% interest
† 1928
†† 50% of voting stock
¶ Formerly Midland Utils. Investment Co.
‡ New companies formed
△ Management or supervisory organization
■ Financial organization
D Deeded
F Franchise
L Leased
N Name changed to Midland United Co.
O Operating Company
W Working control
(1) Through International Paper & Pwr. Co.
(2) Through Northern Mexico Pwr. & Development Co., Ltd.
(3) Through Guanajuato Pwr. & Elec. Co.
(4) Through Peoples Lt. & Pwr. Corp.
(5) Through Greater London & Counties Trust, Ltd.
(6) Through New England Pwr. Assn.
(7) Through Rhode Island Pub. Serv. Co.
(8) Through Bellows Falls Pwr. Co.
(9) Through General Gas & Elec. Corp.
(10) Through Rochester Central Pwr. Corp.
(11) Through Gould Electric Co.
(12) Through Delaware Pub. Serv. Co.
(13) Through Washington Railway & Elec. Co.
(14) Through Florida Pwr. Corp.
(15) Through Georgia Pwr. & Lt. Co.
(16) Through Eastern Shore Pub. Serv. Co., Del.
(17) Through United Pub. Serv.
(18) Through General Pwr. & Lt. Co.
(19) Through Elec. Pub. Utils. Co.
(20) Through Cities Service
(21) Through North American Wtr. Wks. & Elec. Corp
(22) Through National Pub. Serv. Corp.
(23) Through East Coast Utils. Co.
(24) Through Kootenay Pwr. & Lt. Co.
(25) Formerly Gould Elec. Co.

Utility Mergers and Purchases in 1929

Key to holding companies and notes on page 54

New England States

CONNECTICUT

Acquiring Company and Company Involved	*Holding Company*
CONNECTICUT ELEC. SERV. CO.	
Northern Connecticut Pwr. Co.	72
Winsted Gas Co.	72
CONNECTICUT LT. & PWR.	
Eastern Connecticut Pwr.	72
Gaylordsville Elec. Co.	72
Kent Elec. Lt. & Gas Cos.	72
Uncas Pwr. Co.	72
INTERNATIONAL HYDRO. ELEC. SYS. (1)	
Mystic Pwr. Co. (6) (7)	41
LITCHFIELD ELEC. LT. & PWR. CO.	
Washington Elec. Lt. & Pwr. Co.	82
UNITED CORPORATION	
(1) United Illuminating Co.	71–50

MAINE

MAINE PUBLIC SERV. CO. (25)	
Ashland Elec. Lt. & Pwr. Co. (11)	16
Cyr. Elec. Co. (11)	16
Easton Elec. Co. (11)	16
Fort Kent Elec. Co. (11)	16
Katahdin Elec. Co. (11)	16
Maple Grove Elec. Co. (11)	16
Mapleton Elec. Co. (11)	16
Milo Elec. Lt. & Pwr. Co. (11)	16
Prestile Elec. Co. (11)	16
Sherman Elec. Co. (11)	16
Stockholm Lt. & Pwr. Co. (11)	16
The Westfield Elec. Co. (11)	16
NEW ENG. PUB. SERV. CO.	
Bates Mfg. Co.	44
Hill Mfg. Co.	44
Union Wtr. Pwr. Co.	44

MASSACHUSETTS

COLONIAL UTILS. CORP.	
Huntington Elec. Lt. Co.	37
GARDEN ELEC. LT. CO.	
American Woolen Co. Distribution Sys., Royalston & S. Royalston	53
INTERNATIONAL HYDRO. ELEC. SYS. (1)	
Bellows Falls Elec. Co. (6) (8)	41
Fall Mountain Elec. Co. (6) (8)	41
Lawrence Gas & Elec. Co. (6)	41
Lowell Elec. Lt. Corp. (6)	41
New England Pwr. Co. (6)	41
Seekonk Elec. Co. (6)	41
Webster & Southbridge Gas & Elec. Co. (6)	41
NEW ENGLAND GAS & ELEC. ASSN.	
New Bedford Gas & Edison Co.	..
NEW ENGLAND POWER ASSN.	
Attelboro Steam & Elec. Co.	42
NEW ENGLAND PWR. ASSN. AND EASTERN UTILS. ASSOCIATES (JOINTLY)	
Fall River Elec. Lt. Co.	53–29
NEW ENGLAND PWR. ASSOCIATES	
Worcester Elec. Lt. Co.	..
WESTERN MASS. CO.	
Hampshire Elec. Co.	..

NEW HAMPSHIRE

FREEDOM ELEC. CO.	
Freedom Elec. & Pwr. Assn.	..
INTERNATIONAL HYDRO-ELEC. SYS. (1)	
Connecticut River Pwr. Co. (6)	41
Grafton Co. Elec. Lt. & Pwr. Co. ( )	41
NEW ENGLAND GAS & ELEC. ASSOC.	
Derry Elec. Co.	82
PEMIGEWASSET ELEC. CO.	
Baker River Lt. & Pwr. Co.	53a
Plymouth Elec. Lt. Co.	53a
West Campton Lt. & Pwr. Co.	53a
PUBLIC SERV. CO. OF N. H.	
Bethlehem Elec. Lt. Co.	39
Libson Lt. & Pwr. Co.	39

RHODE ISLAND

INTERNATIONAL HYDRO-ELEC. SYS. (1)	
Narragansett Elec. Co. (7) (6)	41
Rhode Island Pwr. Trans. Co. (6)	41
South County Pub. Serv. Co. (8) (7)	41

VERMONT

CENTRAL VERMONT PUB. SERV. CORP.	
Bradford Elec. Lt. Co.	44
Middlebury Elec. Co.	44
Pittsford Power Co.	44
Public Service Corp. of Vt.	44
Rutland Ry. Lt. & Pwr. Co.	44
Vermont Hydro-Elec. Co.	44
Windsor Elec. Lt. Co.	44
COLONIAL UTILS. CORP.	
Pittsford-Chittenden Distribution, Inc.	..
Brownsville Elec. Co., Inc.	..
Cavendish Elec. Lt. Co.	..
Champlain Valley Elec. Co., Inc.	..
Chester Pwr. & Lt. Co.	..
Grafton Lt. & Pwr. Co.	..
Jamaica System.	..
Reading Lt. & Pwr. Co.	..
Wes-lon Lt. & Pwr. Co.	..
Weybridge Lt. & Pwr. Co.	..
UNITED PWR., GAS & WTR. ASSN.	
Burlington Lt. & Pwr. Co. (4)	..
Peoples Hydro-Elec. Vt. Corp. (4)	..

Middle Atlantic States

NEW JERSEY

ASSOCIATED GAS & ELECTRIC CO.	
New Jersey Pwr. & Lt. Co. (9)	82
JERSEY CENTRAL PWR. & LT. CO.	
Chatham Munic. Lt. & Pwr. Plant, Elec. distr. Sys.	44

NEW YORK

ANDREWS & CO., J. T.	
Water rights on Lake Keuka	12–82
ANTWERP LT. & PWR. CO.	
Theresa Hydro-Elec. Lt. Co.	..
ASSOCIATED GAS & ELEC. CO.	
Binghamton Lt., Ht. & Pwr. Co. (9)	82
Cooper Gas & Elec. Co. (10)	82
Elmira Wtr., Lt., & R.R. Co. (10)	82
Empire Gas & Elec. Co. (10)	82
Geneseo Gas Lt. Co. (10)	82
Hilton Elec. Lt., Pwr. & Ht. Co. (10)	82
Lockport Lt., Ht. & Pwr. Co. (10)	82
Long Lake Lt., Ht. & Pwr. Co.	82
Mt. Morris Illuminating Co. (10)	82
New York Central Elec. Corp. (10)	82
Rochester Gas & Elec. Corp. (10)	82
BROOKLYN EDISON CO.	
Gerrittsen Elec. Co., Elec. distr. Sys.	26
EASTERN NEW YORK ELEC. & GAS CO.	
Berlin Elec. Light, Heat & Pwr. Co.	..
EMPIRE GAS & ELEC. CO.	
Jordan Elec. Lt. & Pwr. Co.	8
Marcellus Ltg. Co.	8
GLIDDEN, MORRIS & CO.	
Ticonderoga Lt. & Pwr. Co.	..
LOCKPORT LT., HT. & PWR. CO.	
International Pwr. & Trans. Co.	12
NEW YORK CENTRAL ELEC. CORP.	
Salt Point Elec. Lt. & Pwr. Corp.	12
Schuyler Elec. Lt. & Pwr. Corp.	12
Woodhull Elec. Lt. Co.	12
NEW YORK PWR. & LT. CORP.	
Montgomery Elec. Lt. & Pwr. Co.	54
NEW YORK STATE ELEC. CORP.	
Eastern New York Elec. & Gas Co., Inc	12
M. B. Lt. & Pwr. Co., Inc., Morrisville	12
Morris Lt. & Pwr. Corp.	12
Northern Adirondack Power Co.	12
Tri-County Lt. & Pwr. Co.	12
Wallkill Valley Elec. Lt. & Pwr. Co.	12
NEW YORK STATE ELEC. & GAS CORP.	
Delaware & Otsego Lt. & Pwr. Co.	..
NIAGARA HUDSON PWR. CORP.	
Frontier Corp., Pwr. Sys.	54
St. Lawrence County Utils. Inc.	54
NIAGARA PWR. CORP.	
Buffalo Gen. Elec. Co.	54
Lockport & Newfane Pwr. & Wtr. Supply Co.; Hydro. Plt.	54
Niagara Elec. Service Co.	54
Niagara Falls Pwr. Co.	54
Niagara, Lockport & Ont. Pwr. Co.	54
Tonawanda Pwr. Co.	54
NORTHERN NEW YORK UTIL., INC.	
Chas. Pillmore-Elec. Pwr. & Lt. Sys.	59
OSWEGATCHIE LT. & PWR. CO.	
Rossie Elec. & Mfg. Corp.	..
ROCHESTER GAS & ELEC. CORP.	
Boliver-Richburg Elec. Corp.	12
Cooper Elec. Corp.	12
Geneseo Gas & Lt. Co.	12
Genesee Valley Pwr. Co.	12
Hilton Elec. Lt., Pwr. & Ht. Co.	12
Mount Morris Illum. Co.	49
Nunda Elec. Lt. Co.	49
ST. LAWRENCE CO. UTILS.	
Norwood Elec. Lt. & Pwr. Co.	..
ST. LAWRENCE VALLEY PWR. CORP.	
Norwood Elec. Lt. & Pwr. Co., Hydro-Elec. plant at Yatesville	..
UNITED GAS IMPROVEMENT CO.	
Erie County Elec. Co.	..
VALLEY IMPROVEMENT ASSN.	
Arrowhead Mills of Fulton, power rights along Oswego R.	..

PENNSYLVANIA

ASSOCIATED GAS & ELEC. CO.	
American Utilities Co.	82
Metropolitan Edison Co., Reading (9)	82
Northern Pa. Pwr. Co. (9)	82
KEYSTONE PUB. SERV. CO.	
Citizens Lt. & Pwr. Co., Oil City	44
Titusville Lt. & Pwr. Co.	44
PENN CENTRAL LT. & PWR. CO.	
Barnesboro Spangler Co.	44
UNITED PWR., GAS & WTR. ASSN.	
Peoples Utils. Pennsylvania Corp (4)	..
WEST PENN PWR. CO.	
Municipal Plant, Emporium, Pa.	11

South Atlantic States

DELAWARE

DELAWARE ELEC. PWR. CO.	
American Pwr. Co. (12)	72
Delaware Pwr. & Lt. Co.	72
Newcastle County Elec. Co. (12)	72
Trans. from Wilmington to Md. line and to Townsend, Del.	

Acquiring Company and Company Involved	Holding Company
DISTRICT OF COLUMBIA	
THE NORTH AM. CO.	
Potomac Elec. Pwr. Co., Washington (13)	..
Washington Ry. & Elec. Co. & Subs.	..
FLORIDA	
ASSOCIATED GAS & ELEC. CO.	
Florida Pub. Serv. Co., Orlando (9)	82
FLORIDA PUB. SERV. CO.	
Winter Garden Munic. Lt. & Wtr. Plant	35
GULF PWR. CO.	
Crestview Lt. Plant	64c
SEABOARD PUB. SERV. CO.	
Florida Pwr. Co. (14)	44
Florida Pwr. Corp. (14)	44
Florida West Coast Pwr. Co. (14)	44
West Florida Pwr. Co. (14)	44
GEORGIA	
EAST-WEST ENGINEERING CO.	
Washington Munic. Elec. & Wtr. Distr. Sys.	..
GEORGIA PWR. CO.	
Augusta-Aiken Ry. & Elec. Corp.	64c
Cedartown Munic. Elec. Lt. Plant	64c
Columbus Elec. Pwr. Co.	64c
Jonesboro Elec. Distr. Sys.	64c
Georgia-Carolina Elec. Co., Georgia prop.	64c
Madison Munic Elec. Lt. & Wtr. Plant	64c
Mutual Lt. & Wtr. Co.	64c
National Utils. Co. of Ga., Manchester & Warm Spgs. Elec. Distr. Sys.	64c
Northern Ga. Lt. & Pwr. Co., 2 small water pwr. plants near Dahlonega	64c
Rutledge Munic. Elec. Distr. Sys.	64c
Warm Springs Elec. Plant	64c
MUTUAL LT. & WTR. CO.	
Sea Island Utils.	64c
SEABOARD PUB. SERV. CO.	
Bainbridge Pwr. Co. (15)	44
Georgia Pwr. & Lt. Co.	44
Ware County Lt. & Pwr. Co. (15)	44
MARYLAND	
ASSOCIATED GAS & ELEC. CO.	
Maryland Pub. Serv. Co. (9)	82
CENTERVILLE MUNIC. SYS.	
Church Hill Munic. Elec. Plant	..
ELECTRIC SHAREHOLDINGS CORP.	
(i) Consolidated Gas, Elec. Lt. & Pwr. Co. of Baltimore	17–38
EMPIRE PUB. SERV. CORP.	
Antietam Elec. Lt. & Pwr. Co.	31a
Betterton Ice & Elec. Co.	31a
Emmitsburg Elec. Co.	31a
Home Elec. Lt. Co., Lonaconing	31a
Maryland East Coast Utils.	31a
Midland Elec. Lt. Co.	31a
Suburban Elec. Co.	31a
MARYLAND EAST COAST UTILS.	
Oxford Munic. Ltg. Plt.	28
SEABORAD PUB. SERV. CO.	
Consumers Pub. Serv. Co. (16)	44
Delmarva Pwr. Co. (16)	44
Eastern Shores Pub. Serv. Co., Md. (16)	44
Fawn Lt. & Pwr. Co.	44
UNITED CORP.	
(i) Consolidated Gas, Elec. Lt. & Pwr. Co. of Baltimore	71–50
NORTH CAROLINA	
CAROLINA PWR. & LT. CO.	
Haywood Elec. Pwr. Co.	51
EAST COAST UTILS. CHICAGO	
A. W. Whitehurst, pwr. site, etc., French Broad River	..
EMPIRE PUB. SERV. CORP.	
Blowing Rock Lt. & Pwr. Co.	31a
Northwest Carolina Utils. (23)	31a
IVES & DAVIDSON, N. Y.	
Almond Lt. & Pwr. Co.	..
JUPOLLO PUB. SERV.	
Trans. line from Elkins to Roaring Gap	..
Franklin Munic. Hydro-Elec. Plant	..
Privately Owned Development at L. Tahoma	..
Marion Lt. & Pwr. Co.	..
Privately Owned Plant on the Watauga River	..
NORTHWEST CAROLINA UTILS. CO.	
Roaring Gap (N.C.) Pwr. Sys.	28
SEABOARD PUB. SERV. CO.	
Tide Wtr. Pwr. Co.	44
SOUTHERN PUB. UTILS. CO.	
Alexis Elec. Distr. Sys.	27
Brevard Lt. & Pwr. Co.	27
Cascade Pwr. Co., Distr. Lines	27
Catawba Elec. Distr. Sys.	27
Claremont-Munic Elec. Distr. Sys.	27
Gaston Pwr. & Lt. Co.	27
Goodsonville Elec. Distr. Sys.	27
Mocksville Lt. & Pwr. Plant	27
Mooresville Munic Elec. Distr. Sys.	27
Pilot Mountain Munic Hydro-Elec. Plant.	27
Saw Ltg. & Improvement Co.	27
Stanley Elec. Distr. Sys.	27
Tryon Elec. Serv. Co.	27
Valdese Distr. Sys.	27
SOUTHERN STATES PWR. CO.	
Carolina-Tennessee Pwr. Co.	..
Hayesville Elec. Co.	..
SOUTH CAROLINA	
ASSOCIATED GAS & ELEC. CO.	
Broad River Pwr. Co. (9)	82
Lexington Wtr. Pwr. Co. (9)	82
BROAD RIVER PWR. CO.	
Ridgeway Elec. Lt. & Pwr. Properties	12–35
SOUTH CAROLINA PWR. CO.	
Augusta-Aiken Ry. & Elec. Corp.	64c
Charleston Isle of Palms Trac. Co., Elec. Sys. in Mt. Pleasant, Sullivan's Island and Isle of Palms	64c
Edisto Pub. Serv. Co.	64c
Georgia-Carolina Pwr. Co.	64c
SOUTHERN PUB. UTILS. CO.	
Honea Path Munic. Distr. Sys.	27
Liberty Lt. & Pwr. Co.	27
Simpsonville Munic. Elec. Lt. & Pwr. Sys.	27
South Carolina Gas & Elec. Co.	27
Wateree Pwr. Co., Small Sys. in Spartanburg Co.	27
West Union Distr. Sys.	27
VIRGINIA	
AM. WTR. WKS. & ELEC. CO.	
Loudoun Lt. & Pwr. Co.	11
EMPIRE PUB. SERV. CORP.	
Old Dominion Pub. Serv. Co.	31a
Somerset Elec. Co.	31a
Virginia East Coast Utils. (23)	31a
OLD DOMINION PWR. CO.	
Stuart Lt. & Pwr. Co.	44
OLD DOMINION PUB. SERV. CORP.	
Troutdale Hydro-Elec. Plant	44
SEABOARD PUB. SERV. CO.	
Eastern Shore Pub. Serv. Co., Va. (16)	44
Virginia Pub. Serv. Co.	44
SUPERIOR ELEC. PWR. CO. OF OHIO	
Amelia, Pwr. Plant (Leander O'Neill)	..
VIRGINIA ELEC. & PWR. CO.	
Virginia-Carolina Pwr. Co. of Va.	32a
VIRGINIA PUB. SERV. CO.	
Leesburg Elec. Co.	44
Harpers Ferry Elec. Lt. & Pwr. Co.	44
UNNAMED CHICAGO INTEREST	
Knightly Lt. & Pwr. Co.	..
WEST VIRGINIA	
APPALACHIAN ELEC. PWR. CO.	
Athens Pwr. Co.	6
FEDERAL PUBLIC SERV. CORP.	
Hamlin Wtr., Lt. & Fuel Co.	..
Hurricane Lt. & Pwr. Co.	..
INSULL INTERESTS	
Harpers Ferry Paper Co., Water rights in Potomac and Shenandoah	45
MONONGAHELA-WEST PENN SERV. CO.	
Richwood Lt. & Wtr. Co.	11
POTOMAC EDISON CO.	
Keyser Lt. & Pwr. Co.	11
Piedmont Elec. Lt. & Pwr. Co.	11
SEABOARD PUB. SERV. CO.	
Virginia Pub. Serv. Co.	44
WEST VIRGINIA PUB. SERV. CO.	
Webster Spgs. Wtr. Wks. & Elec. Lt. Co.	11
WHEELING ELEC. CO.	
Wheeling Pub. Serv. Co.	6

East North Central States

Acquiring Company and Company Involved	Holding Company
ILLINOIS	
CENTRAL ILLINOIS PUB. SERV. CO.	
Alto Pass Elec. Util. Property (L. H. Pirtle, Inc.)	44
Bowen Elec. Pwr. & Lt. Corp.	44
Ferris Lt. & Pwr. Co.	44
Golconda Lt. & Wtr. Co.	44
Hamburg Munic. Elec. Property	44
Hidalgo Munic. Elec. Property	44
Jonesboro Munic. Lt. & Pwr. Plant	44
Prairie Elec. Co.	44
Rose Hill Munic. Elec. Property	44
St. Peter Lt. & Pwr. Co.	44
Smith Pub. Serv. Co.	44
Smithfield Lt. & Pwr. Co.	44
Toledo Munic. Elec. Properties	44
Vienna Munic. Elec. Distr. Sys.	44
West Point Lt. & Pwr. Co.	44
EATON, CYRUS S.	
(w) United Lt. & Pwr. Co.	..
ELECTRIC SHAREHOLDINGS CORP.	
(i) Commonwealth Edison Co.	17–38
EMPIRE PUB. SERV. CORP.	
East Coast Utils. Co.	31a
FEDERAL PUB. SERV. CORP.	
Northwestern Illinois Utils. Co.	70
ILLINOIS PWR. & LT. CORP.	
Brownstown Munic. Lt. & Pwr. Plant	58
Oakville Lt. & Ice Plant (Wm. G. Frank)	58
INLAND UTILS. CO.	
(f) Farmer City Munic. Elec. Distr. Sys.	..
UNION ELEC. LT. & PWR. CO. OF ST. LOUIS	
East St. Louis Pwr. & Lt. Co.	55
Union Elec. Lt. & Pwr. Co. of Illinois	55
WESTERN UNITED GAS & ELEC. CO.	
Western Pub. Serv. Co., Downers Grove, Ill.	81
WISCONSIN PWR. & LT. CO.	
Rockton Elec. Co.	44
INDIANA	
AMERICAN STATES ELEC. CO.	
Dearborn-Ripley Lt. & Pwr. Co.	8a
GENERAL UTILS. CO.	
W. R. Martin Elec. Plant	13
INDIANA ELECTRIC CORP.	
Cartersburg & Monrovia Elec. Co.	45
INDIANA MICHIGAN ELEC. CO.	
Rural Electric Co.	6
INDIANA SERV. CORP.	
Pleasant Mills Lt. & Pwr. Co.	45
Preble Lt. & Pwr. Co.	45
INTERSTATE PUB. SERV. CO.	
Burnettsville Elec. Lt. & Pwr. Co.	45
Clevenger Elec. Co., H. F.	45
Cythiana Lt. & Pwr. Co.	45

Acquiring Company and Company Involved	*Holding Company*
Otterbein Lt. & Pwr. Co.	45
Taylorsville Lt. & Pwr. Co.	45
Trafalgar Lt. & Pwr. Co.	45
Winterowd Elec. Co.	45
KENTUCKY TENN. PWR. CO.	
Flora (plant at)	11a
MIDDLE WEST UTIL. CO.	
Citizens Ht., Lt. & Pwr. Co., Winchester (17)	..
MIDLAND UTILS. CO.	
Union City Elec. Co.	44
MIDLAND UTILS. INV. CO.	
Indiana Hydro-Elec. Pwr. Co.	45
Interstate Pub. Serv. Co.	45
NORTHERN INDIANA PWR. CO.	
Huntington Munic. Elec. Dept.	45
NORTHERN INDIANA PUB. SERV.	
Star Milling & Elec. Co.—Elec. Distr. Sys.	45
SOUTHERN INDIANA GAS & ELEC. CO.	
Boonville Elec. Lt. & Pwr. Co.	23
MICHIGAN	
CITIES SERVICE CO.	
Southern Michigan Lt. & Pwr. Co.	19
LAKE SUPERIOR DISTR. PWR. CO.	
Bergland Elec. Sys.	44
LENAWEE CO. LT. & PWR. CO.	
Tecumseh Elec. Co.—Trans. Line to Ridgeway and Britton—Franchise and Distr. Sys. in Deerfield	19
UNITED CORP.	
(i) Detroit Edison Co.	71–50
UNITED PWR., GAS & WTR. ASSN.	
Northern Pub. Serv. Co. (18)	..
OHIO	
AMERICAN GAS & ELEC. CO.	
Southern Ohio Pub. Serv. Co.—300 Central Ohio Communities	6
ASSOCIATED ELEC. CO.	
No. Baltimore Wtr. & Elec. Co.—G. A. Harrup	11a
ATLANTIC PUB. UTILS.	
Cleveland Southwestern Ry. & Lt. Co.—Elec. Lt. & Pwr. Property only	18
Western Reserve Pwr. & Lt. Co.	18
COMMONWEALTH UTILS. CORP.	
Columbus, Delaware & Marion Elec. Co.	24
EMPIRE PUB. SERV. CORP.	
No. Baltimore Serv. Co. (19)	31a
Rudolph Lt. & Pwr. Co. (19)	31a
Toledo, Bowling Green & So. Trac. Co (19) (Elec. Lt. & Pwr. in Findlay, etc.)	31a
Wooster Elec. Co. (19)	31a
Western Ohio Ry. & Pwr. Corp.	..
INVESTERS TELEPHONE CO.	
Green Spgs. Elec. Lt. Co.	..
LAKE ERIE PWR. & LT. CO.	
Gibsonburg Elec. Lt. Co.	..
MIDDLE WEST UTIL. CO.	
Brookville-Lewisburg Ltg. Co. (17)	..
Buckeye Lt. & Pwr. Co. (17)	..
Eaton Ltg. Co. (17)	..
Greenville Elec. Lt. & Pwr. Co. (17)	..
New Madison Ltg. Co. (17)	..
MIDLAND UTILS. INV. CO.	
General Utils. Co.	45
NORTHERN OHIO PWR. & LT. CO.	
Barberton Munic. Elec. Sys	61
OHIO EDISON CO.	
London Lt. & Pwr. Co. (M. J. Kehoe)	23
London Munic. Plant F	23
North Lewisburg Lt. & Pwr. Co.	23
OHIO ELEC. PWR. CO.	
Ansonia Ltg. Co.—14 Communities in Southwestern Ohio	44
Farm Home Elec. Co.—Santa Fe, Montra and Holden	44
Rockford (Ohio) Lt. & Pwr. Co.	44
OHIO PUB. SERV. CO.	
Put-in Bay Improvement Co	19
Worthington Lt. & Pwr. Co.	19
THE TENNESSEE ELEC. PWR. CO.	
Celina Elec. Plant	23
UNITED PUB. SERVICE CO.	
Bradford & Gettysburg Elec. Lt. & Pwr. Co.	..
WISCONSIN	
DAVID G. FISHER	
Northern Wisconsin Hydro-Elec. Co.	..
INTERSTATE PWR. CO.	
Eastman Elec. Co.	77
LAKE SUPERIOR DISTR. PWR. CO.	
Mason Elec. Sys.	44
NORTHERN STATES PWR. CO.	
Loyal Munic. Elec. Distr. Sys.	66
UNITED PWR., GAS & WTR. ASSN.	
Wisconsin Hydro-Elec. Co. (4)	..
WISCONSIN GAS & ELEC. CO.	
Hartford-Rubicon Elec. Co.	55
WISCONSIN HYDRO-ELEC. CO.	
Durand Lt. & Pwr. Co.	8
WISCONSIN PWR. & LT. CO.	
Amherst Elec. Co.	44
Badger Lt. & Pwr. Co.	44
Hillpoint Elec. Co.	44
Lindsay Lt. & Pwr. Co.	44
Loganville Lt. & Pwr. Co.	44
Northwestern Lt. & Pwr. Co.	44
Open View Valley Elec. Co.	44
Randolph Munic Pwr. & Lt. Plant	44
Southern Wisc. Elec. Co.	44
Spring Valley Elec. Co.	44
Westfield Elec. Co.	44

East South Central States

ALABAMA

ALABAMA PWR. CO.	
Alabama Water Service Co.	64c
Cordova Lt. & Pwr. Co. (G. Elliott)	64c
Gulf Utils. Co.	64c
AMERICAN COMMONWEALTH PWR. CORP.	
Birmingham Elec. Co.—Gas Properties only	51
CENTRAL PUB. SERV. CORP.	
Alabama Pwr. Co.—Gas Plants, Selma, Montgomery, Tuscaloosa, Anniston and Decatur, Ala.	16
(W) GENERAL WATER WKS. & ELEC. CORP., DEL.	
Andalusia Lt. & Pwr. Co.	..
Opp Lt. & Pwr. Co.	..
Pea River Pwr. Co.	..
River Falls Pwr. Co.	..
GEORGIA PWR. CO.	
Newbern Munic. Distr. Sys.	64c

KENTUCKY

BYLLESBY INTERESTS	
Louisa Lt. & Pwr. Co.	66
Salyersville Gas, Elec. & Ice Co.	66
West Liberty Elec. & Gas Co.	66
FEDERAL PUB. SERV. CORP.	
Louisa Lt. & Pwr. Co.	70
KENTUCKY ELEC. DEVELOP. CO.	
Glen Brook Pwr. Co.	..
Kentucky Serv. Co.—Yosemite and Middleburg	..
Lane Lumber & Milling Co., Hydro-Elec. Pwr. Plant at Rio.	..
KENTUCKY-TENNESSEE LT. & PWR. CO.	
A. P. White & Co., Cadiz Plant	12
KENTUCKY UTILS. CO.	
Coleman & Smith, Brandenburg	44
Kentucky Hydro-Elec. Co.	44
Tucker Coal Co., Rockport	44
MIDDLE WEST UTIL. CO.	
Kentucky Pwr. & Lt. Co. (17)	44

MISSISSIPPI

CENTRAL PUB. SERV. CORP., CHICAGO	
Mississippi Pwr. Co.—Gas plants at Columbus, Hattiesburg and Meridian	16
MISSISSIPPI PWR. CO.	
Blue Mountain Ltg. Plant	64c
Inland Utils. Corp.	64c
MISSISSIPPI UTILS. CO.	
Carthage Pwr. & Lt. Co.—R. L. Jordan	31
Mississippi Pwr. Co.—Property at Philadelphia	..
Quitman Elec. Distr. Sys.—Long Bell Lbr. Co.	..
UNITED PWR., GAS & WTR. ASSN.	
Miss. Pub. Utils. Co. (18)	..
Southern Edison Co. (18)	..
UTILITIES SERVICE CO.	
Ripley Utils. Co.	..

TENNESSEE

KENTUCKY-TENNESSEE LT. & PWR. CO.	
Plants at Dover, Ridgely Tiptonville, Wynnburg	12
TENNESSEE CENTRAL SERV. CO.	
Bluff City Elec. Lt. & Pwr. Co. (20)	69
Bristol Gas & Elec. Co. (20)	69
Butler Elec. Lt. & Pwr. Co. (20)	69
Elk Park Lt. & Pwr. Co. (20)	69
Erwin Lt. & Pwr. Co. (20)	69
Johnson City Tract. Co. (20)	69
Newland Lt. & Pwr. Co. (20)	69
Roans Creek Lt. & Pwr. Co. (20)	69
Tennessee Eastern Elec. Co. (20)	69
Watauga Pwr. Co. (20)	69
TENNESSEE ELEC. PWR. CO.	
Gordonsville Lt. Plant	23
Southern Cities Pwr. Co.	23

West North Central States

IOWA

CENTRAL WEST PUB. SERV. CO.	
Clear Lake Elec. Lt. & Pwr. Co.	43
CITIZENS PWR. & LT. CO.	
Citizens Gas & Elec. Co. of Council Bluffs—Changed Name	7
Iowa Pwr. & Lt. Co.	7
IOWA ELEC. CO.	
(f) Felderman Bros. & Hayes Ltg. Sys. in Lamotte	..
(f) Lost Nation, Iowa, Elec. Serv.	..
IOWA-NEBR. LT. & PWR. CO.	
Farragut Pub. Serv. Co.	73
(f) Shenandoah Munic.	73
IOWA PUB. SERV. CO.	
Orange Elec. Co.	3
Soldier Munic. Elec. Distr. Sys.	3
IOWA RAILWAY & LT. CORP.	
Salem Gladbrook Distr. Sys.	..
IOWA SOUTHERN UTILS. CO.	
Munic. Elec. Lt. Plant, Corydon	..

KANSAS

EMPIRE PUB. SERV. CORP.	
Caney Elec. Co. (19)	31a
KANSAS ELEC. PWR. CO.	
Mound Valley Munic. Distr. Sys.	44
KANSAS PWR. & LT. CO.	
Atchison Munic. St. Ltg. Sys.	58
UNITED PWR. & LT. CORP.	
Alta Vista Munic. Elec. Distr. Sys.	58
UNITED PWR., GAS & WTR. ASSN.	
Peoples Utils. Kansas Corp.	..

Acquiring Company and Company Involved	*Holding Company*
MINNESOTA	
FEDERAL PUB. SERV. CORP.	
Northwestern Pub. Utils. Inc.	..
Root River Pwr. & Lt. Co.	..
Rushford Pwr. Co.	..
NORTHWESTERN PUB. UTILS. INC.	
Nicollet Elec. Co.	33
OTTER TAIL PWR. CO.	
Alberta Elec. Sys.	..
Dent Elec. Lt. Co.	..
Lansford Pur. Plant.	..
Norcross Elec. Distr. Sys.	..
Richville Elec. Sys.	..
PEOPLES LT. & PWR. CO.	
Eastern Minn. Pwr. Co.	75a
UNITED PWR., GAS & WTR. ASSN.	
Peoples Minn. Gas & Elec. Corp. (4)	..
MISSOURI	
MISSOURI EDISON CO.	
East Mo. Pwr. & Lt. Co., Troy.	22
MISSOURI PWR. & LT. CO.	
LaGrange Lt. & Wtr. Plant.	58
Lohman Distr. Sys.	58
Russellville Distr. Sys.	58
MISSOURI PUBLIC SERV. CO.	
Galt. Lt. Plant.	22
Windsor Lt. & Pwr. Co.	22
ST. JOSEPH RY., LT., HT., & PWR. CO.	
De Kalb Elec. Lt. & Pwr. Co.	19
Hemple Elec. Lt. & Pwr. Co.	19
Rushville Elec. Lt. & Pwr. Co.	19
UNION ELEC. LT. & PWR. CO.	
Missouri Hydro-Elec. Pwr. Co.	55
St. Joseph Lead Co.—Rivermines Plant.	55
NEBRASKA	
ALBERTSON CO., W. N.	
Plants from 50 Util. Corps	..
CENTRAL PWR. CO.	
Denman, Town of	..
Hansen, Town of	44
Hayland, Town of	44
Heartwell Elec. Distr. Sys.	44
Kenesaw Munic. Distr. Sys.	44
Palmyra Elec. Distr. Sys.	44
Prosser, Town of	44
St. Liborty, Town of	44
Unadilla, Town of	44
ELKHORN VALLEY PWR. CO.	
Creston, Town of	..
IOWA-NEBR. LT. & PWR. CO.	
Adams Munic. Elec. Distr. Sys.	73
Bancroft Munic. Plant	73
Bee Munic. Plant	73
Bellwood Munic. Plant	73
Benedict Munic. Plant	73
Cortland, private	73
Craig, Munic. Plant	73
Dawson, private	73
Denton Munic. Plant	73
Gresham Munic. Plant	73
Town of Hickman—Trans. lines and Distr. Sys. of Denton—Trans. Line from Lincoln	73
Linwood Munic. Plant	73
Lorna	73
Martell Lt. Plant	73
Octavia Munic. Plant	73
Pawnee City Munic. Distr. Sys.	73
Pickrell Munic. Plant	73
Sprague, private	73
Staplehurst, private	73
Stockham Munic. Plant	73
Teckamah Munic. Plant	73
Western, Town of	73
NEBRASKA ELEC. PWR. CO.	
Atlanta Munic. Plant	32a
Blue Creek Ltg. & Pwr. Co.	32a
Bushnell Munic. Ltg. Plant	32a
Edison Munic. Distr. Sys.	32a
Hendley Elec. Plant	32a
Madrid Munic. Plant	32a
Oshkosh Munic. Ltg. Plant	32a
NEBRASKA PWR. CO.	
Morse Bluff Munic. Plant	7
NORTHWESTERN PUB. SERV. CO.	
Tornor, Town of	44
SOUTHERN NEBRASKA PWR. CO.	
Carlton Munic. Plant	..
Inavale Munic. Plant	..
Riverton Munic. Plant	..
Saronville, private	..

Acquiring Company and Company Involved	*Holding Company*
WESTERN PUB. SERV. CO.	
Bloomington Munic. Plant	32a
Dunning Munic. Plant	32a
Grant Munic. Plant	32a
Greeley Munic. Plant	32a
Hemingford Lt. & Pwr. Co.	32a
Huntley Munic. Plant	32a
Lisco Ltg. Plant	32a
Merriman Munic. Plant	32a
Miller Munic. Plant	32a
Napanee Munic. Plant	32a
Nebraska Elec. Pwr. Co.	32a
Rulo Munic. Plant	32a
Sidney Munic. Lt. & Pwr. Plant	32a
Scotia Munic. Plant	32a
Seneca, private	32a
Stamford Munic. Plant	32a
Venango Munic. Plant	32a
NORTH DAKOTA	
CARL HASENWINKLE, REGENT	
Bison Elec. Lt. Co.	..
MONTANA-DAKOTA PWR. CO.	
City Water & Lt. Dept., Williston, N. D.—City Electrical Distri. Sys.	47
NORTH DAKOTA PWR. & LT. CO.	
Center Lt. Co., Elec. property.	75
Hughes Elec. Co., name changed.	75
Judson, N. D. Elec. Lt. Plant.	75
NORTHERN PWR. & LT. CO.	
Forbes Elec. Co.	75
Selfridge Munic. Plant.	75
NORTHWESTERN PUB. SERV.	
Knife River Coal Mining Co.	44
No. Dak. Pwr. & Lt. Co. (17)	44
Northern Pwr. & Lt. Co., Mobridge (17)	44
OTTER TAIL PWR. CO.	
Brampton Farmers Elevator Co.	..
Glenburn Garage & Lt. Plant.	..
SOUTH DAKOTA	
CENTRAL WEST PUB. SERV. CO.	
Eagle Butte Elec. Lt. Plant—A. E. Chambers.	43
MONTANA-DAKOTA PWR. CO.	
Elec. Lt. Plant, Camp Crook	47
NORTHWESTERN PUB SERV. CO.	
Langford Munic. Plant.	44
OTTER TAIL PWR. CO.	
Newark Munic. Elec. Distr. Sys.	..
UNION PUB. SERV. CO.	
Lake Norden Munic. Elec. Lt. Sys.	..

West South Central States

ARKANSAS

ARKANSAS PWR. & LT. CO.	
Akransas Pub. Serv. Co., Berryville, Danville, Green Forest, Harrisburg, Lepanto and Ola.	77
Southwestern Gas & Elec. Co., Plant at Harrison, Ark.	31
MO.-ARKANSAS PWR. & LT. CO.	
Handy Pwr., Lt., & Ice Co., power plant.	..
OKLAHOMA GAS & ELEC. CO.	
Franklin Utils. Co., Branch Charleston & Ratcliff.	66
UNITED PWR., GAS & WTR. ASSN.	
Southern Edison Co. (18)	..
WILSON PWR. & LT. CO.	
Lepanto, Light Plant.	..

LOUISIANA

EMPIRE PUB. SERV. CORP.	
Louisiana Ice & Utils., Inc. (19)	31a
LOUISIANA PWR. & LT. CO.	
Donaldsonville Munic. Pwr. Plant.	31
J. J. McKeithen, Grayson.	31
Waterproof Munic. Plant.	31
LOUISIANA PWR. CO.	
Tallulah Munic. Lt. Plant.	..
MISSISSIPPI UTILS. CO.	
St. Francisville Munic. Lt. & Wtr. Plant.	..

Acquiring Company and Company Involved	*Holding Company*
OKLAHOMA	
EMPIRE PUB. SERV. CORP.	
Okla. Utils. Co. (19)	31a
OKLAHOMA GAS & ELEC. CO.	
(*f*) Achille Distr. Sys.	66
Baker, Earl W., Elec. prop. at Asher, Byars & Wanette.	66
(*f*) Moffatt Munic. Distr. Sys.	66
Noble Munic. Elec. Distr. Sys.	66
(*k*) Okla. Ry. Co., Belle Isle Elec. Plant.	66
Red Hook Munic. Distr. & Trans. Sys.	66
Southwest Pwr. Co., Alva.	66
OKLAHOMA PWR. & WTR. CO.	
Bigheart Lt. & Pwr. Co.	..
Cimarron Lt. & Pwr. Co.	..
Eastern Okla. Lt. & Pwr. Co.	..
Sand Springs Lt., Pwr. & Wtr. Co.	..
Wynona Elec. Util. Sys.	..
PANHANDLE PUB. SERV. CO.	
Hooker Munic. Elec. Lt. & Pwr. Plant.	10
PUBLIC SERVICE CO. OF OKLA.	
Baker & Co., Earl W.—Vici.	44
Bartlesville Gas & Elec. Co., except Alva prop.	44
Carmargo Elec. Distr. Sys.	44
Seiling Lt. & Pwr. Co.	44
Stigler Lt. & Pwr. Co.	44
Taloga Munic. Elec. Lt. Plant.	44
Westville Munic. Plant.	44
SOUTHWESTERN LT. & PWR. CO.	
Hydro Munic. Elec. Lt. Plant.	44
Texola Elec. Lt. Plant.	44
TEXAS-LOUISIANA PWR. CO.	
Inland Util. Co., Guaymon Plant. Plants at Higgins & Perryton, Distr. Sys. at Darrougeth, Follett, Booker & Spearman, Tex., Goodwell, Okla.	36

TEXAS

CENTRAL PWR. & LT. CO.	
Falfurrias Lt. & Gin. Co., Elec. Lt. & Pwr. part of business.	44
Harper Elec. Prop.	44
Rock Springs Lt. Co.	44
Runge Munic. Wtr. & Lt. Plant.	44
CENTRAL & SOUTH WEST UTILS. CO.	
Borderland Utils. Corp., Balmorhea, Blackwell, Marathon & Presidio.	44
EMPIRE PUB. SERV. CORP.	
South West Utils. Corp., Texas.	31a
GULF STATES UTILS. CO.	
Western Pub. Serv. Co., Texas prop. only.	32a
SAN ANTONIO PUB. SERV. CO.	
Fentress Elec. Sys.	..
Prairie Lee Elec. Sys.	..
SOUTH WEST UTILS. CORP.	
Big Spring Pub. Serv. Co.	32
Consumers Natural Gas & Pwr. Co.	32
Texas Elec. Co.	32
TEXAS LOUISIANA PWR. CO.	
Inland Utils. Co., Gen. Plants at Guaymon Okla., Perryton & Higgins, Tex., Distr. Sys. at Darrougeth, Follett, Booker & Spearman, Tex. & Goodwell, Okla.	36
Spearman Wtr., Lt. & Ice Plant.	36
Woodville Elec. Co.	36
TEXAS PWR. & LT. CO.	
Bryant Lt. & Pwr. Co.	7
TEXAS PUB. SERVICE CO.	
Lagrange Pwr. & Lt. Co.	75a
Smithville Elec. Lt. & Water Co.	75a
Weimar Pwr. & Lt. Co.	75a
TEXAS UTILS. CO.	
Gaines County Pub. Serv. Co.	2
WEST TEXAS UTILS. CO.	
Eaton & Sons, J. D.	44
Sonora Lt. & Wtr. Co.	44

Mountain States

ARIZONA

CENTRAL ARIZ. LT. & PWR. CO.	
Tempe Elec. Lt., Pwr. & Gas Utils.	30

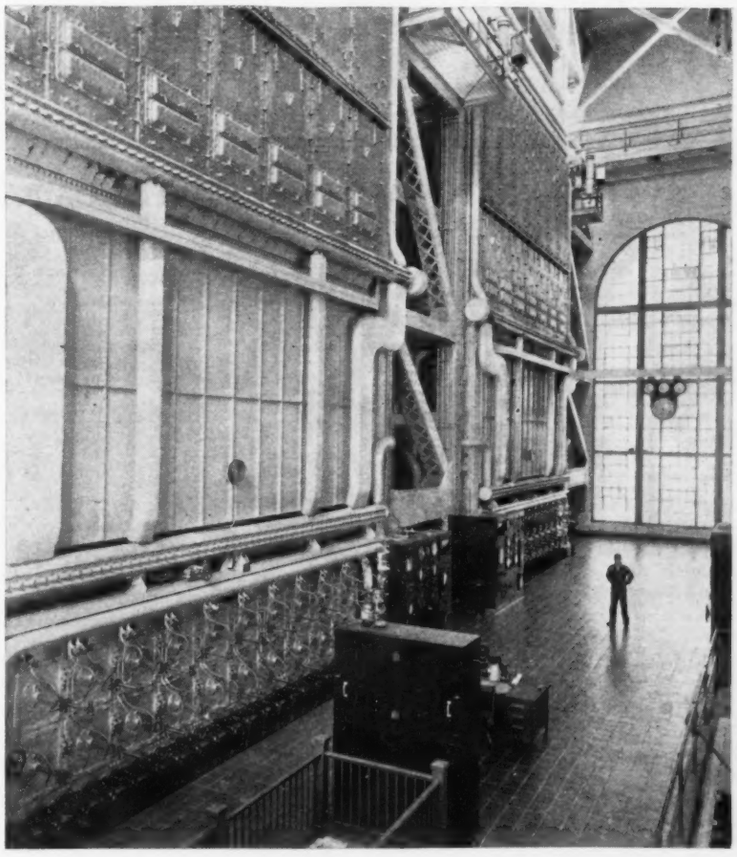
Acquiring Company and Company Involved	*Holding Company*
COMMONWEALTH UTILS. CORP., ST. LOUIS	
Ariz. Pwr. Co. (F. E. Kingston & Co.), Prop. at Phoenix & Prescott	24
FOSHAY CO., W. B.	
Williams Munic. Wtr. & Elec. Plant	..
UNITED PWR., GAS & WTR. ASSN.	
Arizona Edison Co. (4)	..
COLORADO	
COMMONWEALTH UTILS. CORP.	
Castle Rock Elec. Plant	..
EMPIRE PUB. SERV. CO.	
Colorado Central Pwr. Co. (19)	68
INMAN UTILS. CO., KANSAS CITY	
Stratton Elec. Plant	..
PUBLIC SERVICE CO.	
Gilpin County Lt., Ht. & Pwr. Co.	19
La Jara Elec. Plant	19
Sedgwick Munic. Plant	19
Summit Co. Pwr. Co.	19
SOUTHERN COLO. PWR. CO.	
Custer Co. Elec. Co.	15
WESTERN COLO. PWR. CO.	
Hotchkiss Pwr. & Lt. Co.	30
IDAHO	
UTAH POWER & LT. CO.	
Grace (Idaho) Munic. Plant & Sys.	31
WASHINGTON WTR. PWR. CO.	
Kootenai Pwr. Co., Coeur d'Alene, Transaction includes Consumers Wtr. Co. & Inland Sales Co.	..

Acquiring Company and Company Involved	*Holding Company*
NEW MEXICO	
MESILLA VALLEY ELEC. CO.	
Hatch Distr. Sys.	36
UTAH	
FOSHAY CO., W. B.	
Dixie Pwr. Co.	..
UTAH PWR. & LT. CO.	
Elec. Pwr. & Milling Co.	31
WYOMING	
BYLLESBY ENG. & MANAGEMENT CORP.	
Lander Elec. Lt. & Pwr. Co.	66
Northwest Pwr. Co., Thermopolis & Buffalo	66
MOUNTAIN STATES PWR. CO.	
Glenrock Munic. Plant	66
Oil Fields Pwr. Co., Cody	66

Pacific States

Acquiring Company and Company Involved	*Holding Company*
CALIFORNIA	
ELEC. SHAREHOLDINGS CORP.	
(I) Pacific Gas & Elec. Co.	38
PACIFIC GAS & ELEC. CO.	
California Tele. & Lt. Co., Sonoma & Lake Counties	..
PACIFIC PUB. SERV. CO.	
Coast Counties Gas & Elec. Co.	76
PUBLIC UTILS. CALIF. CORP.	
Hotchkiss Elec. Co., J. M., Crescent City.	34
SIERRA PACIFIC PWR. CO.	
Grizzly Elec. Co., J. B. Young, Portola	68
UNITED PWR., GAS & WTR. CO.	
Peoples Calif. Hydro-Elec. Corp. (4)	74
OREGON	
AMERICAN ENGINEERING & MGT. CORP.	
Hermiston Lt. & Pwr. Co., Hermiston, Echo, Umatillo & Stanfield	..
CALIFORNIA-OREGON PWR. CO.	
Munic. Elec. & Wtr. Utils. of Oakland	66
COLUMBIA UTILS. CO., PORTLAND	
Columbia Lt. & Pwr. Co.	..
Veronia Lt. & Pwr. Co.	..
PUBLIC UTIL. HOLDING CORP.	
E. W. Clark holdings in Portland Elec. Pwr. Co.	63
UNITED PWR., GAS & WTR. ASSOC.	
Peoples West Coast Hydro-Elec. Corp. (4).	..
Western States Utils. Co. (18)	..
WASHINGTON	
LOEB & SHAW, INC.	
Washington Gas & Elec. Co.	57
PUGET SOUND PWR. & LT. CO.	
Darrington Lt. & Pwr. Co., Holdings including Elec. Distr. Sys. of Everett	32a

Approaching the Ideal



The most recent addition to the Long Beach station of the Southern California Edison Company comes close indeed to being the ideal of perfect housekeeping and centralized control.

United States Possessions

CUBA

Acquiring Company and Company Involved	*Holding Company*
SOUTHERN CITIES UTIL. SYS.	
Elec. & Water Sys. in Santiago	65

HAWAII

UTILITIES SERVICE CO.	
Hilo Elec. Lt. Co.	..

PANAMA

AMERICAN & FOREIGN PWR. CO.	
Cia Panamena de Fuerza e Luz	30

Canada

Acquiring Company and Company Involved	*Holding Company*
AMERICAN & FOREIGN PWR. CORP.	
Duncan Utils., Ltd.	..
Namimo Elec. Lt., Pwr. & Ht. Co.	..
AVON RIVER PWR. CO.	
Chester Lt. & Pwr. Co.	..
Edison Elec. Lt. & Pwr. Co., Springhill, N. S.	..
Oxford Elec. Lt. Plant	..
BRITISH COLUMBIA ELEC. RAILWAY CO.	
Kamloops Munic. Hydro-Elec. & Steam Plant	14a
National Utils. Corp.	14a
Parksville Lt. & Pwr. Co.	14a
Royston Lt. & Pwr. Co.	14a
CALGARY PWR. CO., LTD.	
Calgary Water Pwr. Co., Ltd.	63a
Camrose Munic. Elec. & Wtr. Wks. Plant.	63a
United Elec. & Engineering Co., Ltd., 100 miles trans. lines	63a
CANADIAN WTR. WKS. & ELEC. CO.	
Kamloops Pwr. Plant & Distr. Sys.	
EAST KOOTENAY PWR. CO.	
(F) Fernie Munic. Plant & Sys.	62a
FOSHAY CO., W. B.	
Cargill Elec. Lt. & Pwr. Co.	..
Sauble Falls Lt. & Pwr. Co.	..
INTERNATIONAL HYDRO-ELEC. SYS. (1)	
Gatineau Elec. Lt. Co., Ltd.	41–53
Gatineau Pwr. Co.	41–53
St. John River Pwr. Co.	41–53
NATIONAL UTILS. CORP., SPOKANE	
Alberni Munic. Plant	..
Port Alberni Munic. Pwr. Plant & Wtr. rights	..
NEW ENGLAND GAS & ELEC. ASSN.	
Annapolis Valley Elec. Co.	82
Charlottetown Elec. Co., Ltd.	82
Fredericton Elec. Co., Ltd.	82
Maritime Elec. Co., Ltd.	82
Milton Hydro-Elec. Co.	82
St. Stephen & Calais Lt. & Pwr. Co., Ltd.	82
Western Nova Scotia Elec. Co., Ltd.	82
NORTHERN BRITISH COLUMBIA PWR. CORP.	
Dunwell Mining Co., Diesel Engine Plant at Stewart	..
ONTARIO HYDRO-ELEC. PWR. COMN.	
M. J. O'Brien Co., Ltd.	..
POWER CORP. OF CANADA	
Prince Rupert Munic. Plant	..
Stewart Munic. Plant	..
QUEBEC PWR. CO.	
Quebec Ry., Lt., Ht., & Pwr. Co.	63b
SHAWINIGAN WTR. & PWR. CO.	
Lawrentide Pwr. Co.	..
WESTERN CANADA HYDRO-ELEC. CO.	
Armstrong City Pwr. Plant	..
WILSEY & CO., R. E.	
West Canadian Hydro-Elec. Corp.	..

For key and notes see page 54

Foreign

Acquiring Company and Company Involved	*Holding Company*
AMERICAN & FOREIGN PWR. CO.	
Atlas Lt. & Pwr. Co., Ltd. of England	30
Bello Horizonte Munic. Elec. Plant, Brazil	30
Cia. Agricola y de Fuerza Electrica del Rio Conchos, S. A. (2)	30
Cia. de Hielo de Cienoga	30
Cia. de Hielo de Santa Marta	30
Cia. de Luz y. Fuerza Motriz Electrica de Saltillo, S. A.	30
Cia. Durango de Luz Electrica, S. A.	30
Cia. de Servicios Publicos de Santa Marta.	30
Cia. Energia Electrica Rio Grandense.	30
Cia. Forca e Luz do Parana	30
Cia. Hidroelectrica Queretaro, S. A.	30
Cia. Paulista de Forca e Luz	30
Cia. Productora y Abastecedora de Potencia Electrica, S. A.	30
Empresa de Electricadade de Araraquara	30
Empresa de Energia Electrica de Honda	30
Ferrocarril Electrico de Lerdo a Torreon	30
Mexican Utils. Co.	30
Michoacan Pwr. Co. (3)	30
Northern Mexico Pwr. & Dev. Co.	30
(II) Tata Sons Ltd., of India	30
COMPANIA ELECTRICA DE SANTO DOMINGO	
Elec. Sys. in La Vega	65
Elec. Sys. in Puerto Plata	65
GREATER LONDON & COUNTIES TRUST, LTD.	
Shropshire, Worcestershire & Staffordshire Elec. Co.	77a
INTERNATIONAL SUPER PWR. CORP.	
(I) Barcelona Lt. & Pwr. Co., Ltd.	..
SHANGHAI PWR. CO.	
Elec. Properties of International Stetlement Shanghai, China	4–30
SOUTHERN CITIES UTILS. CO.	
Elec. & Wtr. Wks., Dominican Republic	..
Elec. & Gas properties on Island of Malloria	..
UNITED PWR., GAS & WTR. CO.	
Cia. de Servicios Publicos de Agua Prieta, S. A. (4)	..
UTILITIES PWR. & LT. CORP.	
Bedfordshire, Cambridgeshire & Huntingdonshire Elec. Co. (5)	..
Cookham & District Elec. Corp., Ltd. (5)	..
East Anglian Elec. Supply Co., Ltd. (5)	..
Edmundson's Elec. Supply Co. ( )	..
Oxford Elec. Co., Ltd. (5)	..
Wessex Elec. Co. (5)	..
Western Elec. Supply Co., Ltd. (5)	..

MUNICIPAL SYSTEMS ABSORBED BY PRIVATE COMPANIES, 1929

Alabama
Newbern

Arizona
†Williams

Arkansas
Leplanto

Colorado
Castle Rock
La Jara
Sedgwick
Stratton

Florida
Crestview
Winter Garden ‡

Georgia
Cedartown
Jonesboro
†Madison
Rutledge
Warm Springs
Washington ‡

Idaho
Grace

Illinois
Brownstown
*Farmer City
†Hamburg
†Hidalgo
Jonesboro
†Rose Hill
†Toledo
†Vienna

Indiana
Huntington

Iowa
Corydon
*Shenandoah
Soldier

Kansas
Alta Vista
Atchison
Mound Valley

Louisiana
Donaldsonville
St. Francisville
Tallulah
Waterproof

Maryland
Church Hill
Oxford

Michigan
†Bergland

Minnesota
Alberta
Lansford
Norcross
Richville

Mississippi
Blue Mountain
Quitman

Missouri
La Grange
†Lohman
†Russellville

Nebraska
Adams
†Atlanta
Bancroft
Bee
Bellwood
Benedict
Bloomington
Bushnell
Carlton
Craig
Creston
Denton
Dunning
Edison
Grant
Greeley
Gresham
Heartwell
Hendley
Hickman
Huntley
Inavale
Juanita
Kenesaw
Linwood
Lisco
Madrid
Merriman
Miller
Morse Bluff
Naponee
Octavia
Oshkosh
Palmyra
‡Pawnee City
Pickrell
Prosser
Riverton
Rulo
Scotia
Sidney
Stamford
Stockham
Tekamah
Unadilla
Venango
Western‡

New Hampshire
Freedom

New Jersey
Chatham

North Carolina
Alexis
Catawba
Claremont
Franklin
Goodsonville
Mocksville
Mooresville
Pilot Mtn.
Roaring Gap
Stanley

North Dakota
Glenburn
Selfridge
Williston

Ohio
†Barberton
Celina
*London

Oklahoma
*Achille
Carmargo
Hooker
Hydro
*Moffett
Noble
Red Hook
Taloga
Texola
Wynona

Oregon
Oakland

Pennsylvania
Emporium

South Carolina
†Honea Path
Ridgeway
Simpsonville
West Union

South Dakota
Camp Crook
Lake Norden
Langford
Newark

Tennessee
Dover
Gordonsville
Ridgeley
Tiptonville
Wynnburg

Texas
Fentress
Harper
Prairie Lee
Runge
Spearman

Vermont
Jamaica

Virginia
Troutdale
Loyal

Wisconsin
†Mason
Randolph

Wyoming
Glenrock

CANADA
Albernie
Armstrong
Camrose
Fernie
Kamloops
Port Albernie
Prince Rupert
Stewart

***Franchise**
†Dec. 1928
‡Leased

Domestic Use Increases 14%

A STUDY of the energy sales of 41 large utilities to domestic customers shows they sold 2,500,000,000 kw.-hr. in 1928, a gain of 14 per cent over 1927. The use per customer changed from 473 to 507 kw.-hr. per year in the period. Thus, despite an appreciable gain each year the goal of about 7,800 kw.-hr. per customer is still far distant. The nearest approach to this goal is a figure of 1,542 kw.-hr. by a Pacific Coast utility.

An analysis of the accompanying tables and charts shows some interesting data regarding domestic energy use. One striking feature is that since 1926 the rate of growth has been accelerated, and this date corresponds with a time the utility industry actively started to intensify service to the homes. Another interesting feature is that the greatest gain in use is in the South, where very aggressive selling methods have been instituted. On the Pacific Coast the aggressive selling of ranges and water heaters has brought the consumption to a higher figure than is found elsewhere. The effect of dilution is still appreciable. The number of customers increased about 10 per cent during the 1928 year, as compared to a total energy sale increase of 14 per cent and an increase in sales per customer of about 6 per cent. Many small-use customers are added each year and only a small percentage of customers use large consumption appliances. It may be said, therefore, that the increased energy sales per customer are just keeping ahead of the influence of the addition of new small-use customers. This means many years of work at the present rate of progress and with present selling methods before the goal of the industry is reached. It is interesting to note also that data available indicate that the increased revenue per customer is a smaller amount than the increased energy use per customer, thus indicating the gain in energy sales is largely at low rates per unit of energy sold.

The data indicate once more that the electrical

41 Utilities Average 507 Kw.-Hr. per Domestic Customer

Section	1925	1926	1927	1928 Maximum	1928 Minimum
New England	330	335	371	441	373
Middle Atlantic	394	440	471	760	358
South Atlantic	393	423	472	525	435
East North Central	478	493	518	575	443
West North Central	372	382	410	544	347
East South Central	317	345	397	444	376
West South Central	349	345	365	430	352
Mountain	517	512	500	895	345
Pacific	508	592	603	1,542	474
Total United States	447	452	473	507	

Domestic Energy Sales of 41 Utilities Larger

Company	1925		1926		1927		1928	
	Kw.-Hr. Sold to Residential Customers	Kw.-Hr. Sales per Customer per Year	Kw.-Hr. Sold to Residential Customers	Kw.-Hr. Sales per Customer per Year	Kw.-Hr. Sold to Residential Customers	Kw.-Hr. Sales per Customer per Year	Kw.-Hr. Sold to Residential Customers	Kw.-Hr. Sales per Customer per Year
NEW ENGLAND:								
The Connecticut Lt. & Pr. Co.	16,236,089	316	21,948,792	335	29,422,192	382	35,524,397	437
Hartford Electric Light Co.	15,931,000	368	18,016,000	350	21,528,000	392	25,206,000	441
The Worcester Electric Light Co.	13,165,643	302	13,645,498	316	15,279,816	326	17,056,074	373
Total	45,332,732		53,610,290		66,230,008		77,786,471	
Weighted average		**330**		**335**		**371**		**422**
MIDDLE ATLANTIC:								
The Philadelphia Electric Co.	107,057,718	333	132,397,085	370	152,056,338	391	171,575,361	410
Buffalo General Electric Co.	83,822,470	676	127,403,317	679	152,154,721	721	169,860,810	760
Pennsylvania Pr. & Lt. Co.	34,770,110	279	40,531,764	331	47,406,463	331	81,496,970	358
Penn. Central Pr. & Lt. Co.	12,968,105	379	15,095,775	412	17,975,621	449	18,686,997	454
Total	238,618,403		315,427,941		369,593,143		441,620,138	
Weighted average		**394**		**440**		**471**		**485**
SOUTH ATLANTIC:								
Consolidated Gas, El. Lt. & Pr. Co.	55,027,695	402	66,560,168	441	79,934,496	486	92,911,390	525
Carolina Pr. & Lt. Co.	5,818,447	319	15,423,274	363	18,797,604	412	22,102,115	435
Total	60,846,142		81,983,442		98,732,100		115,013,505	
Weighted average		**393**		**423**		**472**		**506**
EAST NORTH CENTRAL:								
Pennsylvania-Ohio Pr. & Lt. Co.	26,639,435	472	32,882,798	476	36,950,438	498	40,941,313	500
Commonwealth Edison Co.	323,219,000	476	360,664,000	494	401,411,000	521	438,323,000	562
Ohio Public Service Co.	25,223,854	457	24,802,909	414	28,740,072	458	33,362,488	504
Detroit Edison Co.	174,359,654	478	207,081,514	517	229,321,950	532	259,562,571	561
Toledo Edison Co.	30,672,610	437	28,325,661	392	32,739,235	414	38,062,338	464
Cleveland Electric Illum. Co.	106,070,467	498	119,539,668	500	133,259,334	544	146,932,924	575
Central Ill. Lt. Co.	8,935,037	310	10,287,192	344	11,693,975	374	14,487,141	443
Total	695,120,057		783,583,722		874,116,004		971,671,775	
Weighted average		**478**		**493**		**518**		**553**
WEST NORTH CENTRAL:								
Wisconsin Public Service Co.	7,277,529	283	7,575,981	280	8,742,656	302	11,076,899	347
Northern States Power Co.	80,734,981	281	89,712,204	354	101,727,071	382	113,882,808	414
Minnesota Pr. & Lt. Co.	15,966,663	433	14,577,881	394	15,298,435	409	16,385,210	438
Kansas Gas & Electric Co.	15,256,801	370	16,749,976	387	19,159,123	425	21,425,344	454
Kansas City Pr. & Lt. Co.	41,055,468	446	44,775,633	467	50,744,171	507	56,388,633	553
Empire District Electric Co.	5,967,268	393	4,724,971	276	5,718,735	286	6,240,919	357
Nebraska Power Co.	19,604,728	420	21,180,617	444	23,386,763	455	29,085,262	544
Total	185,863,430		224,776,954		224,776,954		254,485,075	
Weighted average		**372**		**382**		**410**		**451**
EAST SOUTH CENTRAL:								
Southeastern Pr. & Lt. Co.	21,321,481	324			72,743,000	411	89,885,929	435
Birmingham Electric Co.	11,828,759	304	14,062,973	320	16,275,270	347	19,456,044	376
Memphis Power & Light Co.	10,490,936	333	12,001,571	617	14,038,153	396	16,086,234	444
Total	43,640,776		26,064,544		103,056,423		125,428,207	
Weighted average		**317**		**345**		**397**		**427**
WEST SOUTH CENTRAL:								
New Orleans Public Service, Inc.	16,235,561	301	23,674,850	356	26,887,637	398	29,561,092	430
Texas Power & Light Co.	15,920,936	315	20,515,336	324	24,588,491	355	29,545,446	387
Houston Lighting & Power Co.	15,290,963	345	18,272,428	361	21,738,990	377	25,617,181	404
Oklahoma Gas & Electric Co.	18,824,840	342	20,257,738	308	24,801,103	337	31,807,479	356
Dallas Power & Light Co.	16,561,509	365	18,734,802	383	20,336,844	397	23,119,297	430
Fort Worth Power & Light Co.	10,323,569	390	9,776,813	358	9,195,701	312	11,176,377	352
Total	93,156,378		111,231,967		127,548,766		150,826,872	
Weighted average		**340**		**345**		**365**		**393**
MOUNTAIN:								
Montana Power Co.	16,548,715	463	18,896,370	516	18,073,861	493		
Utah Power & Light Co.	30,045,109	388	32,935,935	405	36,340,105	436	37,575,972	442
Public Service Co. of Colorado	27,544,797	328	29,666,653	316	31,078,971	326	33,704,602	345
Idaho Power Co.	45,655,688	1,400	44,705,449	1,290	38,002,012	1,150	30,754,762	895
Total	119,794,309		126,204,407		123,494,949		102,035,336	
Weighted average		**517**		**512**		**500**		**470**
PACIFIC:								
Portland Electric Pr. Co.	39,490,832	546	47,729,764	597	45,769,814	545	68,013,731	771
California-Oregon Pr. Co.	15,157,635	1,178	17,959,327	1,210	22,145,964	1,420	26,005,686	1,542
Northwestern Electric Co.	10,732,935	670	15,366,999	817	19,148,307	936	22,288,054	1,020
Los Angeles Gas & Electric Co.	38,365,656	382	41,886,208	388	50,593,758	440	57,900,000	474
Pacific Pr. & Lt. Co.	14,599,261	454	18,685,601	533	23,171,686	743	37,903,437	778
Total	118,246,319		141,627,829		160,829,529		212,110,908	
Weighted average		**508**		**592**		**603**		**714**
UNITED STATES TOTAL	**1,667,567,484**	**447**	**1,839,031,425**	**452**	**2,148,377,876**	**473**	**2,450,878,287**	**507**

industry is not geared properly to sell economically and in volume to the homes of the country. At present wiring is sold the householder as an item, so are the fixtures, so are the lamps and so is each appliance. Each of these sales is small in money value per prospect and high in sales cost. A method of selling the complete service, including wiring, fixtures, lamps and appliances, as a single sale and at one time must be devised. The householder is interested only in the service value and must be approached from this point of view. In addition to creating a desire for the service, all units in the electrical group must unite to get the goods to the householder in an economical manner. This is a major problem in sales and in distribution.

The Bull Market Ends

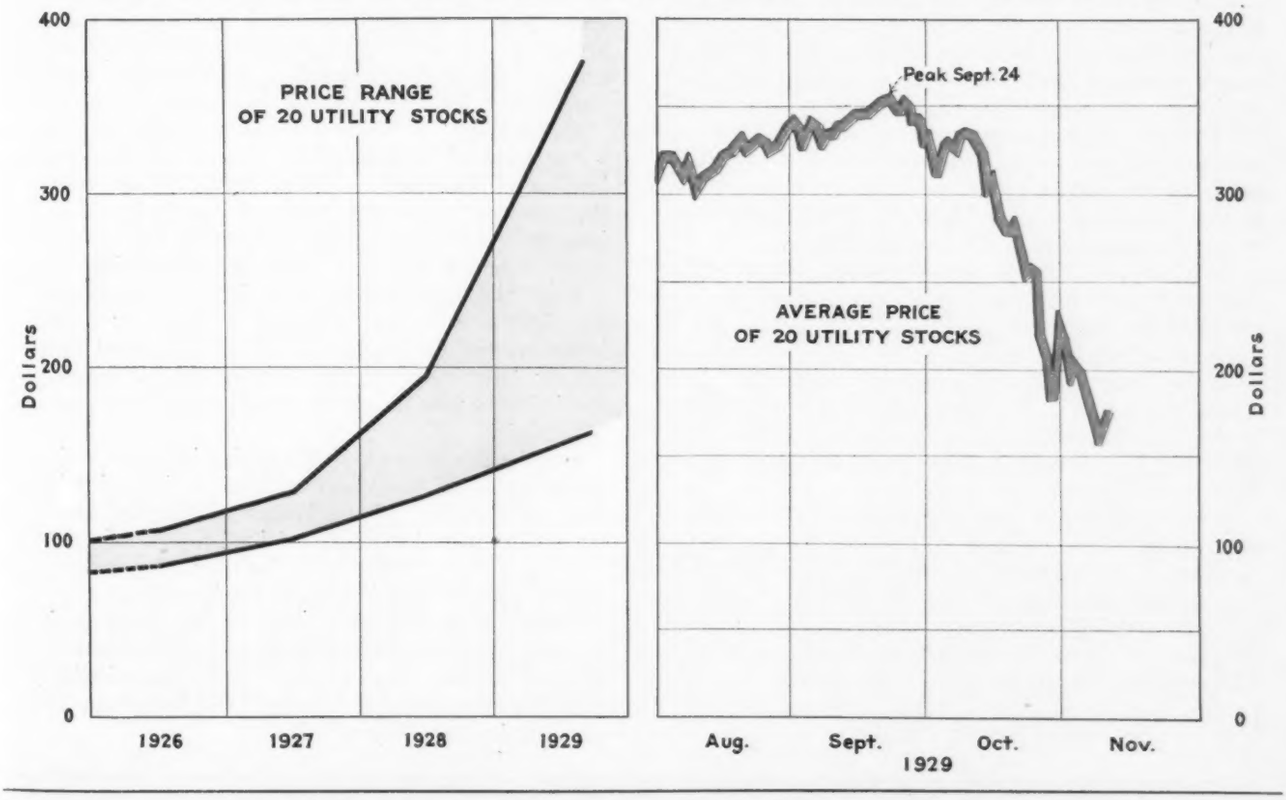
Utility stocks reached 40 times earnings. Confidence wavered, unloading commenced. Prices crashed, financing halted. Confidence slowly returns; market gains and new financing resumed

NINETEEN TWENTY-NINE is added to the series of market panic years. Its claim to first place is well supported. Whether the spectacular demise of history's greatest bull market left any permanent effects in the utility field it is yet too early to say. But within six weeks price levels were well on their way upward, confidence was restored and the utilities were asking the public for new capital to finance the largest construction and improvement program yet attempted.

Sober judgment indicates nothing extraordinary either in the unprecedented levels reached by utility stocks before the break or in the break itself. The former illustrates the law of supply and demand perfectly. The latter is an example of what happens when public confidence in an overextended situation becomes strained. The immediate cause of this loss of confidence is, as usual, a combination of factors.

For some time the market supply of many utility common stocks had been limited. Into this limited market came competing groups for control of particular situa-

1929 PRICE RANGE EIGHT TIMES 1927; PRESENT AVERAGE ONE-HALF PEAK



tions. Not infrequently top-holding companies were formed on a sort of mutual stock division basis and holding groups under these declined to relinquish any of the top-holding company stock, since such a policy would weaken their grip on subsidiary properties. The rapidly matured investment trust movement developed as one of its consequences heavy and rapid accumulation of certain specific stocks, often the same issues as those being acquired by utility holding groups. This was facilitated by the presence on investment trust boards of executives highly placed in utility and banking groups.

Foreign institutions as well as private investors and speculators abroad were an important factor on the buying side, as they were later on the selling side of the market. This seems to have been overlooked by that faction of the foreign press which hastened to criticise the speculative orgy as being something inherently American. It is now apparent that the inflated condition was part of a world movement, aggravated in America by unequaled industrial and business growth.

Then came the investing and speculative American public with a huge surplus of investible funds, willing to discount earning capacity indefinitely. A new market psychology, professing belief in a more or less permanent upward trend, developed.

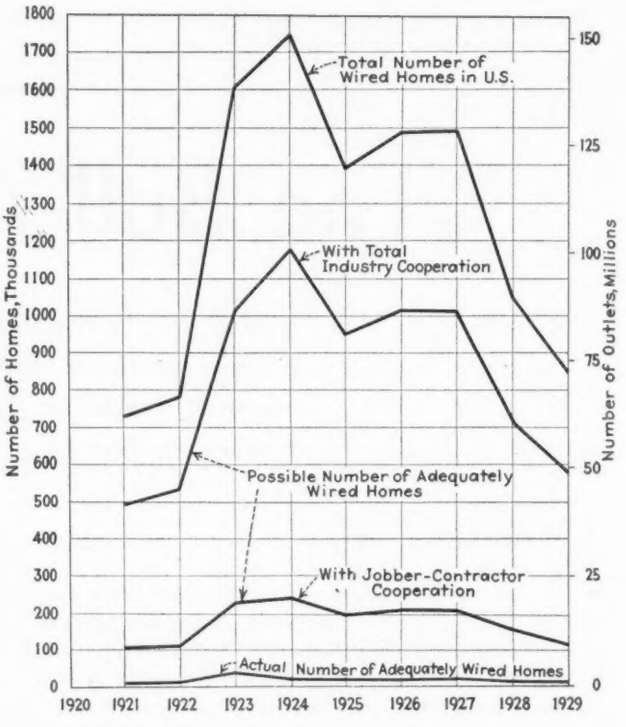
What all this meant in the utility field, why investors were willing to discount utility earnings farther into the future than most other groups, has passed into history. Many utility common stocks sold up to 40 times earnings, which represented yields of less than 2 and sometimes less than 1 per cent. The market became glutted with undigested securities. Investment trusts contributed their share to this. So did the unprecedented volume of rights and warrants for the purchase of common stock. The utility industry, meanwhile, was flourishing. There was every reason to anticipate a steady expansion, with a few unusually promising situations.

But confidence in the hugely inflated structure began to waver even during the summer. The more conservative began to retire from the market. Predictions of a recession were heard. The credit situation was obviously strained. A combination of circumstances in foreign markets induced a gradual and finally feverish unloading of American securities. All this pointed to easy profits on the short side and professional short interests began to take advantage of a critical situation, utterly regardless of the menace to business and industry.

What happened in the utility market is here pictured. The peak was reached late in September, as figures compiled by Standard Statistics Company show. The break, however, did not take place until October 24, after which averages sold down almost two-thirds. Utility stocks were in the forefront of the selling movement as they were among the first to recover. By the end of 1929 they had recouped probably one-third, on the average, of their losses.

Market predictions at the beginning of the year differ widely. The outlook is affected by a variety of conditions. There are few who anticipate a rapid market recovery to anywhere near old levels. Apart, however, from fairly heavy tax selling toward the end of the year, each recession brought forth substantial buying. The rather uncertain business situation will have an important bearing on market trends. There is nothing to indicate any loss of public confidence in the industry.

313,000,000 Outlets Lost by Present Selling Methods



TO GIVE a more tangible idea of the result of the distribution faults of wiring supply manufacturers, an attempt has been made to compare the existing inadequacy of domestic wiring with what it might be if there were more extensive co-operation of the major groups in the electrical industry and also within these groups. The data are based on information compiled by the Society for Electrical Development.

As the curves indicate, it has been possible to wire only 1.2 per cent of the homes in the United States adequately because of the present plan of selling. This means that the industry has lost the sale and installation of approximately 462,527,856 electric outlets, based on the minimum standard for six-room "red-seal" wiring.

Had the contractors and jobbers co-operated in an effort to sell more adequate wiring they could have increased the percentage of adequately wired homes to 14 per cent, based on actual cases of co-operation, and the industry loss in outlets would have been reduced to 396,571,184.

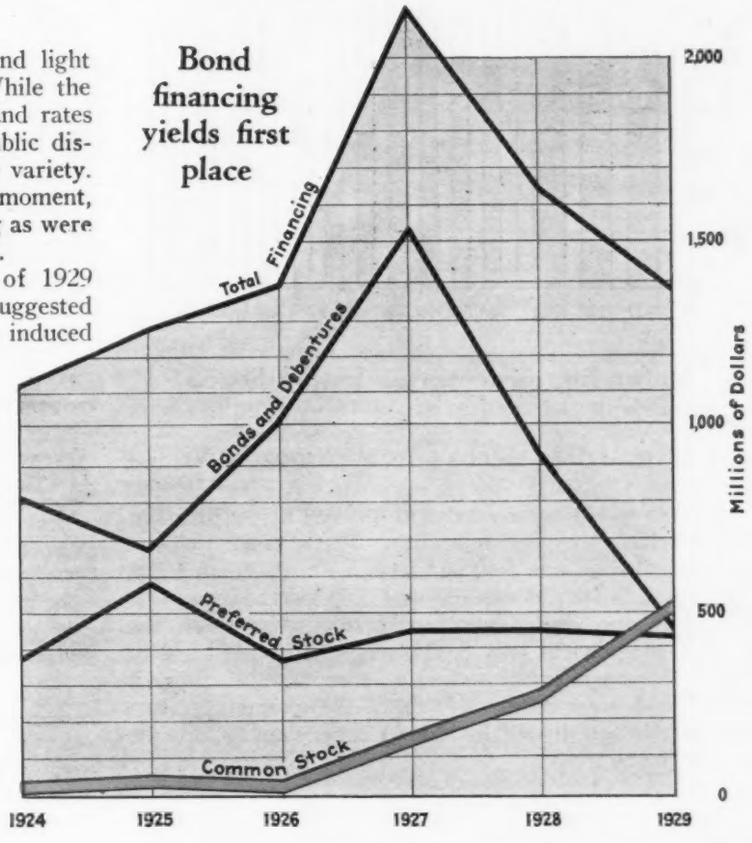
On the other hand, if the entire industry had co-operated it could have accomplished a job of wiring at least 68 per cent of the homes adequately, as recently proved in one city, and sustained a loss of only 150,046,680 outlets. This would be only 32 per cent of the possible number which could be installed.

Over a period of nine years the loss between full co-operation and present selling methods represents 312,481,176 outlets. Recently collected figures indicate that even the new homes and rewired old homes are 50 to 56 per cent inadequately wired.

EQUITY FINANCE LEADS

RAISING $1,460,458,000 for the power and light industry in 1929 was relatively easy. While the bull market lasted money was plentiful and rates were low. The industry flourished and the public displayed an insatiable appetite for stocks of every variety. The market break ended all this and, for the moment, halted new financing completely. But paralyzing as were its immediate effects, they were amazingly brief.

Capital operations for the first ten months of 1929 showed a decided swing to stock financing—suggested by public taste. Rapid market appreciation induced investors and speculators alike to buy common stock to the limit of their capacity. This led to the issue of rights and option warrants to record totals. Rights to buy common stock reached $550,000,000, assuming, of course, that holders exercised them in full or that they were underwritten. A large proportion, naturally, were withdrawn as stocks dipped away below the price at which rights were exercisable. The total remaining is well over $400,000,000. The abundance of these securities which were actively traded in the market is sometimes advanced as an important factor in the market break.

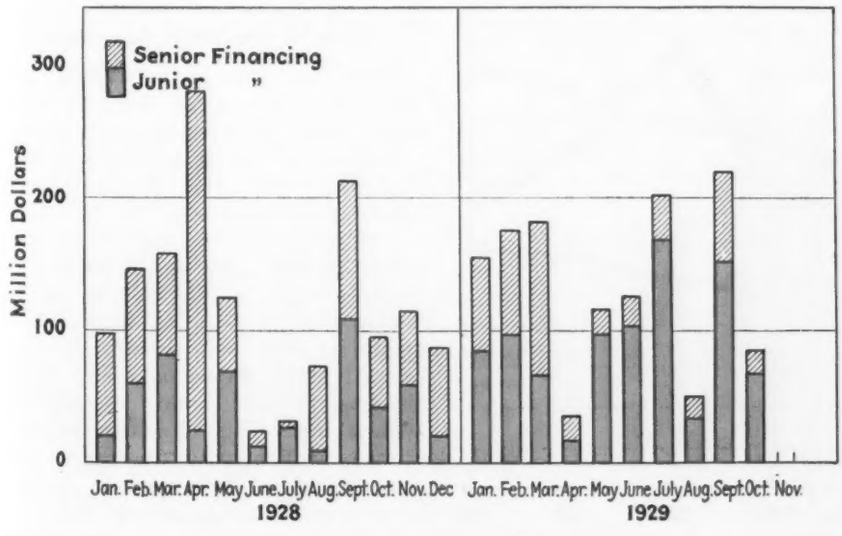


Financing Approaches Five-Year Average

	Sales By Investment Houses	Sales Direct to Customers	Total Securities Sales
1920	$326,374,000	$43,000,000	$369,374,000
1921	458,917,000	80,000,000	538,917,000
1922	589,961,000	130,000,000	719,961,000
1923	747,722,000	175,000,000	922,722,000
1924	982,421,000	254,000,000	1,236,421,000
1925	982,223,000	297,561,000	1,279,784,000
1926	1,150,965,000	236,557,100	1,387,522,100
1927	1,888,909,000	263,527,000	2,150,436,000
1928	1,471,497,000	181,682,041	1,653,179,000
1929	1,315,458,000*	145,000,000	1,460,458,000

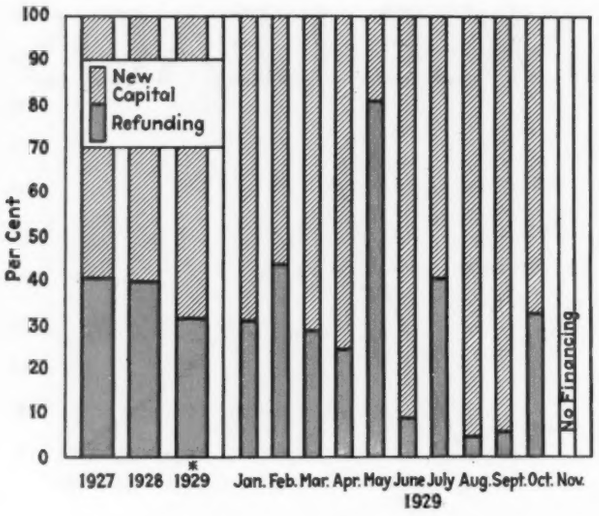
*Including rights.

Senior and junior balance well maintained



Preferred stock sold by the power and light companies aggregated about the same as in 1928. The total sold publicly and to customers last year was $431,248,000, against $458,884,000 in 1928. Customer sales fell off from $182,000,000 to $145,000,000, while sales through investment bankers rose marginally, from $276,884,000 to $286,248,000.

Following the trend to increased stock financing there was a sharp reduction in the volume of mortgage bonds sold. The total was $215,882,500, against $435,810,100 in 1928. Even in this type of financing the demand for a speculative flavor reflected itself in the addition of the convertible feature and in the offering of bonds with warrants attached. Debentures too slid off



Refunding program no longer heavy

sharply, from $420,288,000 in 1928 to $292,200,000 last year.

Market conditions referred to induced a readjustment in the relative costs of financing. The average yield on mortgage bonds was 5.40 per cent, against 4.69 in 1928. The average for debentures was 5.51 per cent, against 5.22. In the case of preferred stocks, however, the 1929 average yield was 5.60, against 5.74 per cent in 1928. While it is impossible to compute the common stock yield on a comparable basis, the average on outstanding issues dipped to around 2 per cent before the market break.

Utility financing ceased

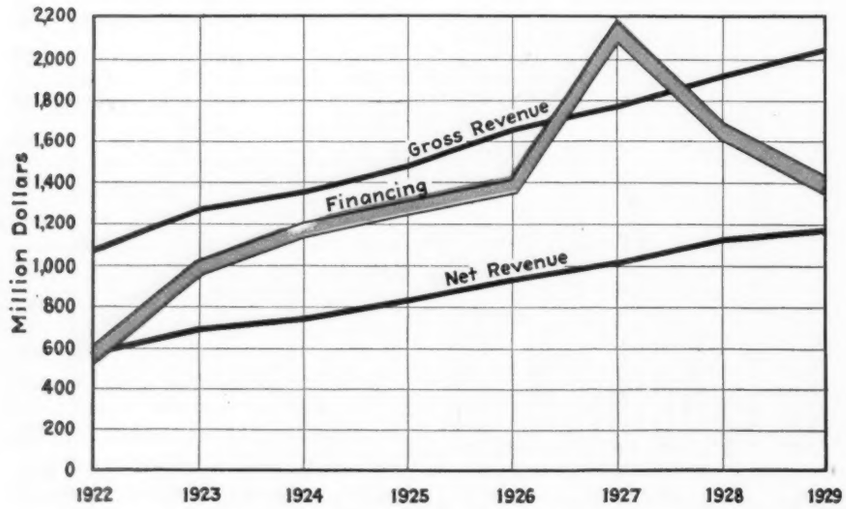
With the October market crash utility financing as well as all other financing stopped short. Many issues had been shaped up for the market, but had to be withheld, and in a few cases were scrapped in favor of some other type of financing. As the bond market showed signs of recovery many utilities decided upon bond flotations as soon as conditions warranted. This solution suggested itself more especially in view of the large volume of stock financing of the past two years. Most of the larger utilities found themselves in a favorable position to plan substantial mortgage financing programs, and several bond issues came into the market toward the close of the year.

To compare with the previous year's operations, total flotations of $1,460,458,762 were 11 per cent below the 1928 total and 31 per cent below the record total of 1927. Customer sales dropped off 20 per cent, to $145,000,000. Bond and debenture issues declined over 40 per cent, while offerings of stock almost doubled.

Electric Light and Power Securities Sold in 1929

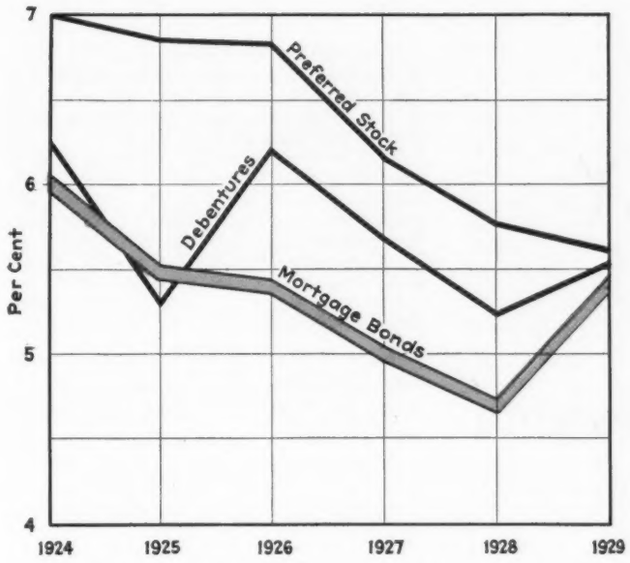
	Amount of Issue	
Mortgage Bonds (average yield 5.40 per cent)		
5 issues yielding from 4.75 to 4.95 per cent...	$25,542,500	
10 issues yielding from 5.00 to 5.06 per cent...	75,166,000	
8 issues yielding from 5.10 to 5.25 per cent...	32,650,000	
5 issues yielding from 5.35 to 5.42 per cent...	34,600,000	
6 issues yielding from 5.65 to 5.87 per cent...	27,687,000	
5 issues yielding from 6.04 to 6.15 per cent...	11,000,000	
5 issues yielding from 6.20 to 7.00 per cent...	9,237,000	
44 issues		$215,882,500
Debentures (average yield 5.51 per cent)		
4 issues yielding from 4.90 to 5.11 per cent...	$49,500,000	
5 issues yielding from 5.14 to 5.50 per cent...	99,400,000	
4 issues yielding from 5.53 to 5.80 per cent...	64,000,000	
4 issues yielding from 6.00 to 6.10 per cent...	32,850,000	
4 issues yielding from 6.12 to 6.25 per cent...	33,000,000	
4 issues yielding from 6.35 to 6.50 per cent...	13,450,000	
25 issues		292,200,000
Notes (average yield 6.94 per cent)		
6 issues yielding from 6.06 to 7.00 per cent...	12,825,000	
3 issues yielding from 7.05 to 7.10 per cent...	2,500,000	
9 issues		15,325,000
Preferred Stock (average yield 5.60 per cent)		
4 issues yielding from 5.50 to 5.88 per cent...	52,000,000	
8 issues yielding from 6.00 to 6.05 per cent...	108,900,000	
5 issues yielding from 6.06 to 6.10 per cent...	26,220,000	
5 issues yielding from 6.18 to 6.25 per cent...	36,778,000	
4 issues yielding from 6.30 to 6.50 per cent...	33,775,000	
4 issues yielding from 7.07 to 7.35 per cent...	8,000,000	
2	19,705,000	
32 issues		286,248,000
Common Stock		
15 issues		63,870,500
Rights		441,932,762
Total public sales		1,315,458,762
Estimated local sales to customers		145,000,000
		$1,460,458,762

Financing trend falls away from revenue trend



Outlook for 1930 financing

How will this year's capital requirements be secured? Banking and utility executive opinion points to an expansion of mortgage bond financing. Obviously, in any capital operations, common stock dividends will be enhanced as the proportion of bonded debt to total capitalization increases. The goal seems to be a happy medium between what many regard as the ideal situation of no bonded indebtedness and the high dividend paying ability obtainable with a small proportion of common stock. Undoubtedly the open end mortgage bond will continue to be prominent. The indentures usually



Yields converge around 5½ per cent

embodied in such open end mortgages prevent the issue of further mortgages until plant investment increases or the business has grown by a definite percentage.

At the moment, investors are still acquiring common stocks which went to low levels during the break. When these have been absorbed bonds will again be in active demand. It is probable that bond money will be available at a quite low rate.

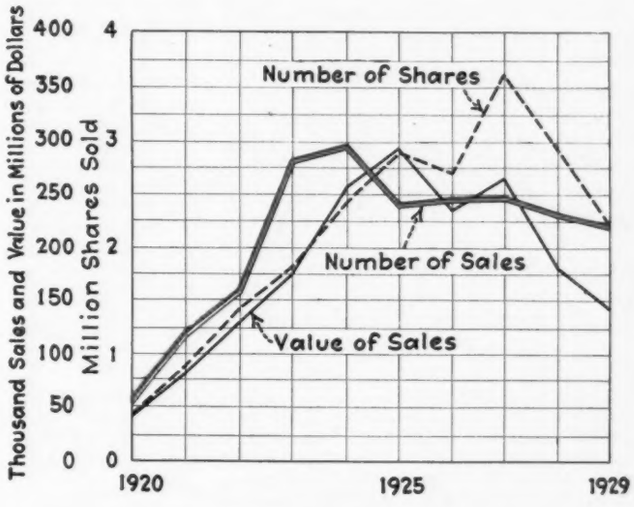
▼▼▼

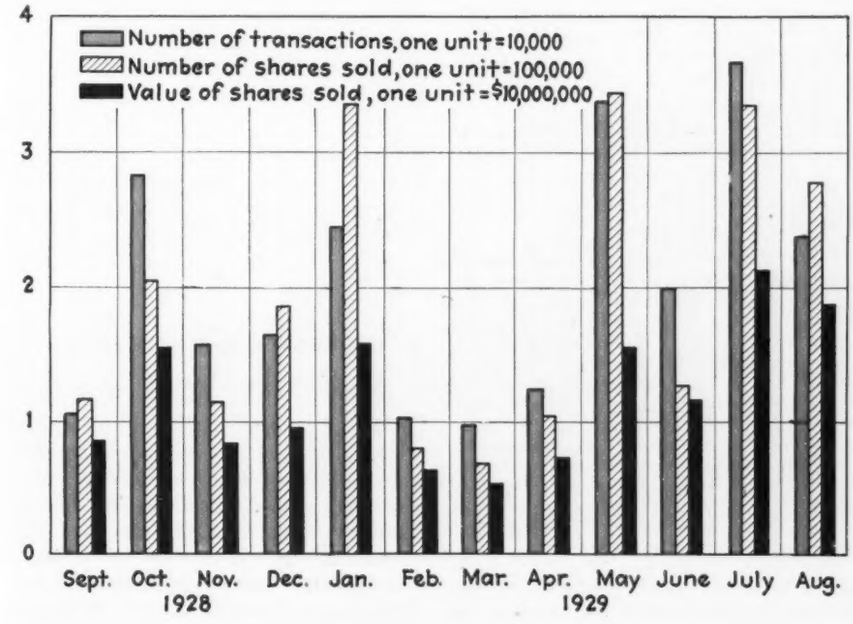
Customer Sales Decline

POWER and light companies in the United States sold less stock to customers last year than in any year since 1922. The face value of such sales in 1929 was $145,000,000, a 20 per cent drop from the 1928 total and a 45 per cent decline from the 1927 figure. An analysis shows that this marked decline was due largely to smaller individual sales. There were about as many actual sales made, but the number of shares sold was down 23.6 per cent, and the aggregate value, as stated, was 20 per cent lower, indicating that the average per customer was sharply reduced.

A Decade of Customer Sales

Year	Number of Sales	Value	Number of Shares
1920	53,063	$43,000,000	454,139
1921	118,544	80,000,000	830,222
1922	156,725	130,000,000	1,450,707
1923	279,186	175,000,000	1,806,300
1924	294,467	254,000,000	2,478,165
1925	236,043	297,561,800	2,926,271
1926	248,867	236,557,100	2,686,187
1927	249,491	263,527,269	3,581,206
1928	227,961	181,682,041	2,880,833
1929	230,000	145,000,000	2,200,000





Explanations notwithstanding, the trend of customer sales has been definitely downward since 1925, the peak year in aggregate values. During the ten-year period just ended customer sales totaled $1,806,327,000. The 1929 total was far below the yearly average of $180,632,700. There has been a corresponding decline in number of shares sold and a less noticeable recession in actual number of sales. There are those among utility leaders who deplore this decline and who urge most persistently and energetically that customer sales should not be neglected regardless of temporary conditions. While some place less importance than this upon yearly trends, all agree that the bedrock of customer-owned stock—now almost two billions—has been one of the most important stabilizing factors in the whole utility situation.

NEWS OF THE INDUSTRY

Decade's Deadlock Over St. Lawrence Likely to Be Unbroken

ONCE more the New York Legislature has convened amid circumstances that probably foreshadow a continuance of the long deadlock over water-power development in that state. Governor Roosevelt, in his second annual message, delivered on New Year's Day, took ground even stronger than his position last year or than that taken by his predecessor, Governor Smith, in message after message, Mr. Roosevelt declaring not only for the development of the St. Lawrence by the government but even for government financing and possession of the transmission system. On this question the Governor said:

Last year after much study I made to the Legislature a definite proposal for the long-delayed development of the state-owned water power of the St. Lawrence River. This was deliberately pigeonholed.

I now renew my recommendation of last year. It was based on a simple declaration of principle—that the ownership, development and operation of the St. Lawrence power resources remain forever in the actual possession of the people of the state or of an agency created by them, and that the electricity so generated be sold to distributors by contract upon a basis to insure a fair and reasonable rate to the consumer, especially the household user.

At the same time I thought it advisable that the state agency should at least provide the financing of and retain the fee to any system of state-wide transmission of electricity made necessary by the new power development. As a mere matter of saving in interest rates alone this would reduce the cost of electricity many millions of dollars each year, for the consumer, of course, pays the interest and dividend charges on the project.

Let us stop once and for all the silly talk that the electricity available by developing the St. Lawrence is not needed or not usable in a practical way. We know that private companies are only too eager to proceed if the state were to abandon its rights.

Let us establish this policy and ask the proposed trustees to submit to the next Legislature a practical plan based on that policy. If they find a plan and it commends itself to the Legislature, let them proceed full steam ahead.

It is becoming more and more clear that the families of this state, whether they live in the cities, in the villages or on the farms, have been paying too much for their electricity, and are therefore not in a position to use to a proper degree the many labor-saving devices of modern invention. Furthermore, rates between different localities show much too great variance, and rural installations are in many cases prohibitive.

Whether mere regulation of electric utilities in the future can be made more successful than it has proved in the past remains a serious question. In the meantime the development of the great state-owned natural resources offers a definite method of relief.

Legislature's Stand

Before the Legislature met, newspapers had predicted some kind of a compromise, it being asserted that up the state there was much dissatisfaction with the Republican water-power policy, which some party leaders were said to hold responsible for four successive failures to elect a governor of that political faith, and Senator Knight, the Republican leader, was reported as favorable to a plan that would meet the Governor's views part way. But when the Republican program was given out on Tuesday it was found to contain the same proposal to investigate by means of a legislative commission that was made fruitlessly two years ago. The Republican platform said:

For a decade Democratic governors of this state, by refusing the administer the law now on the statute books, have blocked the development of electrical power on the St. Lawrence River. While depriving New York industries and domestic consumers of the benefits of this great natural resource, the Democratic executives have brought forward various plans, all of them based upon the proposal that the government in one form or another shall enter the hydro-electrical business. Previous efforts of the Republican party to reach an agreement with the Executive on this important subject have failed.

The right of the people to this great source of wealth must remain forever inalienable, and the control of the energy in the interest of the people must be safeguarded in such manner as to provide the lowest possible rate to the consumer. This is the settled policy of the Republican party and of the State of New York.

This problem must be solved in accordance with sound economic principles. We will agree with the Governor to the appointment of a commission to investigate the practicability and the advisability of his plan, together with other possible plans, and report back to the Governor, the Legislature and the public not later than January 15, 1931.

Thus, even if the Governor accepts the Republican offer, the question of St. Lawrence development will go over for another year.

For New Commission Law

Another point on which the Governor laid emphasis in his message was the need, as he sees it, of a new Public Service Commission law. On this point he said:

Our antiquated Public Service Commission law has proved itself unable to cope with the enormous growth and huge consolidations of public utility corporations, and it has become evident that new methods of regulation, supervision and administration must be devised.

The special legislative commission which has been endeavoring to find out what is the matter with the present Public Service Commission law is expected to report by February 1, and its recommendations will doubtless bring a crowd of bills.

Legislation to give the Public Service Commission jurisdiction over holding companies and investment trusts acquiring and holding utility securities is sure to be introduced, as well as other measures affecting this phase of utility relationship.

Conferences have been held by Governor Roosevelt with utility representatives with the idea of devising a uniform system for determining rural rates and charges for electric service. Bills on this subject, both friendly and hostile, are to be expected, as well as bills upon the proposed restoration to municipalities of the right to determine utility rates and charges, now vested in the Public Service Commission.

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Tennessee Commission on Muscle Shoals

THE Tennessee Railroad and Public Utilities Commission has forwarded to the state delegation in Congress a strong protest against the Norris resolution regarding the proposed development and operation of Muscle Shoals and the contemplated development of Cove Creek. "While it is

highly important that Tennessee's water-power resources be developed and utilized within the state as promptly as possible," the commission says, "it is equally important that the rights of the state be thoroughly safeguarded both against federal usurpation and private spollation."

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Danville Vetoes Sale of Plant; Dunnellon Sells

DANVILLE, Va., by its City Council, has rejected the bid of the People's Light & Power Company of New York for the electric and gas plants operated by the city for nearly forty years. The bid was $3,750,000, to which C. E. Deal, president of the company, added $100,000 toward a fund to be used in inducing new industries to be brought to the city. The corporation plans a hydro-electric development in Patrick County costing more than $2,000,000.

The Florida Power Corporation has purchased the municipal electric plant in Dunnellon, Fla. The town was formerly supplied with wholesale power from the lines of the corporation.

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War Department Reduces Chicago Water Diversion

UPON the recommendation of the Chief of Engineers, the War Department, in renewing the annual permit to the city of Chicago to divert water from Lake Michigan for its Sanitary District, has reduced the amount from 8,500 cu.ft. per second to "7,250 cu.ft. per second, or such lesser annual average diversion as will restrict the average annual flow measured at Lockport to 8,500 cu.ft. per second until July 1, 1930, after which date the amount of diversion will be limited to an annual average of 6,500 cu.ft. per second in addition to domestic pumpage."

This ruling is in line with the report of Special Master Hughes, noted in the ELECTRICAL WORLD for December 21 (page 1238).

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First Link Built in New Shawinigan "High" Line

A NEW transmission line of the Shawinigan Water & Power Company between Grand' Mère and La Tuque, in the Province of Quebec, has been put into operation. This line, 67 miles long, is the first completed portion of the ambitious project to bring the enormous power resources of the upper St. Maurice River to the industrial districts of the province. Started on June 15 and in operation on December 21, the completion of this line, in view of difficulties encountered, is considered an engineering triumph. It is designed to carry 200,000 hp. at 220 kv. In its initial use, however, it is operating as a single-circuit, three-phase line at 66 kv. and is now carrying power from the company's Laurentide plant at Grand' Mère to the mill of the Brown Corporation at La Tuque, thus adding a considerable load to the Shawinigan system.

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Five Great Rivers Figure Before Power Board

A PRELIMINARY permit has been issued by the Federal Power Commission to the Mississippi Power Company, a subsidiary of the Alabama Power Company, covering the project at Colbert Shoals on the Tennessee River. The site is 40 miles down the siver below Muscle Shoals. The development of that site would have an important bearing on the Muscle Shoals project if it were used for public utility purposes, as it would enable the plant at the Wilson Dam to operate on peak load. While the head is lower than at Muscle Shoals, the volume of water is slightly larger. The primary power available is 66,000 hp. It is planned, however, to install 160,000 hp.

Laurence Macomber of Los Angeles has applied for a preliminary permit covering a project on Waldo Lake in Oregon. It is planned to construct a dam across the outlet of the lake, creating a reservoir of 140,000 acre-feet. The power house is to be on Black Creek. There would be a diversion of water from Salmon Creek to that point, and all of the water would be diverted to a second power house on the North Fork of the Middle Fork of the Willamette River. It is planned to install 65,000 hp.

All obstacles seem to have been ironed out in connection with the project of the Washington Electric Company at Rock Island on the Columbia River. A draft of the proposed license has been prepared. One of the conditions is that fishways shall be built as may be required by the Secretary of Commerce.

The Madera (Calif.) Irrigation District has applied to the commission for a preliminary permit covering a 100,000-hp. development on the San Joaquin River. It is proposed to construct a storage dam 4,500 ft. across and 300 ft. high.

Under the plan for operating the dam in the Mississippi River at Red Wing, Minn., it is not feasible to attempt power development. This is the opinion of the Chief of Engineers expressed in a report in connection with an application of the municipality of Red Wing for rights to develop power at the dam.

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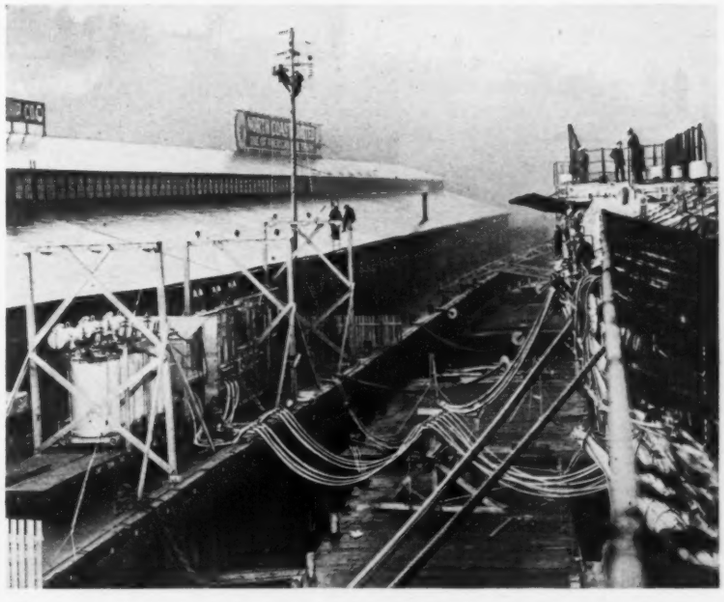
When Is a Ship of the Navy a Central Station?



CONUNDRUMS of this kind present no difficulty to the citizens of Tacoma, Wash., where, as told in the ELECTRICAL WORLD for December 21, the United States Navy's airplane carrier *Lexington* is supplying 20,000 kw. a day for 30 days to the municipal generating plant, hard hit by long drought.

Arizona May Resume Three-State Parleys

RESUMPTION of negotiations between the three states in the lower basin of the Colorado River, instead of immediate resort to the United States Supreme Court, is still possible. On December 24 Governor John C. Phillips of Arizona sent Secretary of the Interior Wilbur a telegram saying that Arizona is willing to resume negotiations with California and Nevada provided that the status of the Boulder Canyon project as agreed upon in Washington be restored and negotiations taken up where they left off in the national capital. The Arizona Governor suggested to Secretary Wilbur that if another tri-state conference be held, it should meet in Arizona.

The telegram was in answer to a communication from Secretary Wilbur suggesting that each of the three states appoint a citizen, not a member of their respective Colorado River commissions, to try to bring about an agreement.

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Prizes Awarded for Food Preservation Essays

HEADED by Matthew S. Sloan, the National Food Preservation Council, which has behind it many organizations, including the N.E.L.A., the N.E.M.A., the S.E.D. and other electrical bodies, has been carrying on an active refrigeration campaign. It has just announced the award of prizes in its nation-wide contest to bring out essays on the subject it has at heart. There were ten prizes, the first three—of $10,000, $3,500 and $2,000 respectively—being won by Dudley L. Harley of Martinsburg, W. Va.; Grace Hampson of Edgewood, R. I., and Grace M. Price of Pittsburgh.

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Power Phase of Couzens Bill Shows Little Vitality Yet

IT IS probable that the power phase of the Couzens Communications and Power Commission bill, on which hearings will be resumed during the week of January 6 by the Senate interstate commerce committee, will be suspended to the extent of abandonment in so far as this session of Congress is concerned. The power phase has been tentatively abandoned already as a feature of the communications bill proper, but with the view of dealing with it separately in another bill. What, if anything, shall be done at this session of Congress may depend on the report being prepared by the Federal Trade Commission, at the request of the committee, on the extent of transmission of electric power across state lines by power companies doing interstate business.

Senator Couzens, who is chairman of the interstate commerce committee, has shown more interest so far in the communications features than in the power sections of his bill. Hearings to date have had to do only with radio, the principal aspect discussed being that involved in the move by the Radio Corporation of America to merge its communication facilities with those of the International Telephone & Telegraph Company.

Police Chief Tries Out "Electric Eye" for Traffic

NEW YORK'S widely known police commissioner, Grover A. Whalen, demonstrated for the first time recently, at "Mazda Avenue" and "Cross Street," Westinghouse Lighting Institute, an automatic light designed to expedite traffic on main highways by eliminating waits at cross streets when there is no cross traffic. Mr. Whalen is shown interrupting a beam of light, known as the "electric eye," with his hand. When a car approaches the light it passes under a lamp suspended over the roadway, thereby casting a shadow on the "electric eye," which is set in the roadbed. This automatically sets into operation the apparatus which changes traffic lights on the highway.

The photograph shows from left to right A. E. Allen, vice-president Westinghouse Lamp Company; A. W. Robertson, chairman board of directors Westinghouse Electric & Manufacturing Company; Commissioner Whalen, and H. G. Wood, Westinghouse engineer.

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Wilbur Sticks to Price of 1.63 Mills for Power

ANSWERING the protest of the Upper Colorado River Basin states that the tentative rate of 1.63 mills to be charged for Boulder Dam power is too low, Secretary Wilbur addressed a letter to the state officials on December 27 declaring that that rate is the maximum that can be demanded against the competition of immediately accessible resources of oil and gas and that the price already is higher than the figure indicated by present-day steam competition. If power generated from oil and gas in southern California can be sold there at a lower price than power transmitted from Boulder Dam after payment of 1.63 mills at the penstocks, it follows, Secretary Wilbur says, that the power cannot be sold in that market at the rate of 1.75 mills proposed by the upper basin states without bankrupting the bidder.

Secretary Wilbur's letter dismissed the arguments made by the upper basin states concerning the price of stored water to the Metropolitan Water District of southern California with the statement that "If power can pay the way, I see no necessity for requiring domestic water to bear an undue burden." Concerning their proposal for creating an advisory commission of the various states, Secretary Wilbur said that the questions involved require decision and responsibility and that he has no desire to ask another body to act.

One item included in fixing the tentative sale price of 1.63 mills for power generated by Boulder Dam has been eliminated entirely as a charge against power revenues and two other items have been scaled down by an opinion rendered by Attorney-General Mitchell at the request of Secretary of the Interior Wilbur. The tentative price embraces interest charges on approximately $40,000,000 to be advanced by the government for construction of the All-American Canal, amortization within a 50-year period of $25,000,000 allocated to flood control, and the payment of interest on the unpaid principal during that period.

Attorney-General Mitchell holds that advances for construction of the canal should not bear interest, that the $25,000,000 allocated to flood control must be amortized but not within any certain period of years, and that if interest is to be paid on the flood-control allocation, payment may be deferred indefinitely and the sale rate of power need not be fixed high enough to meet this charge from year to year.

Coming Meetings

American Engineering Council—Washington, Jan. 9-11. L. W. Wallace, 26 Jackson Place, Washington, D. C.

Conference of Electrical Leagues—Westinghouse Lighting Institute, New York, Jan. 13-16. Society for Electrical Development, 420 Lexington Ave., New York.

Empire State Gas and Electric Association—Women's Section, Hotel Seneca, Rochester, Jan. 16-17. C. H. B. Chapin, Grand Central Terminal, New York.

National Electrical Manufacturers' Association—New York, Jan. 20-24. S. N. Clarkson, 420 Lexington Ave., New York.

Great Lakes Division, N.E.L.A.—Commercial Section, Edgewater Beach Hotel, Chicago, Jan. 20-22. T. C. Polk, Room 910, 140 South Dearborn St., Chicago.

North Central Division, N.E.L.A.—Commercial Section, St. Paul Hotel, St. Paul, Jan. 20-21; Engineering Section, Nicollet Hotel, Minneapolis, Feb. 24-25. J. W. Lapham, 803 Plymouth Bldg., Minneapolis.

National Electrical Credit Association—New England Division, University Club, Boston, Jan. 21. F. P. Vose, 1008 Marquette Bldg., Chicago.

National Association of Purchasing Agents—Public utility group, Mayflower Hotel, Washington, D. C., Jan. 23-24. G. A. Renard, 11 Park Place, New York.

American Institute of Electrical Engineers—Winter meeting, New York, Jan. 27-31. F. L. Hutchinson, 33 West 39th St., New York.

National Electrical Wholesalers' Association—Pacific Division, Del Monte, Calif., Jan. 31-Feb. 1.

Artistic Lighting Equipment Association—Washington, Feb. 9-15. C. L. Benjamin, 420 Lexington Ave., New York.

Northwest Electric Light and Power Association—Commercial Section, Spokane, Feb. 13-15; Accounting Section, Portland, March 17-18; Engineering Section, Aberdeen, Wash., probably week of March 23. B. Snow, 1206 Spalding Bldg., Portland, Ore.

Oklahoma Utilities Association—Mayo Hotel, Tulsa, March 11-13. E. F. McKay, 1020 Petroleum Bldg., Oklahoma City.

National Electric Light Association—San Francisco, June 16-20. A. J. Marshall, 420 Lexington Avenue, New York.

Great Western Power's New Plant Starts Up

FOLLOWING two years of construction work, generation of electricity was started in December at the new San Francisco steam plant of the Great Western Power Company of California. A picture of the new plant, which is at India Basin on the shore of the bay in the southern section of San Francisco, was printed in the ELECTRICAL WORLD for November 9, page 950. It represents a total investment of approximately $3,300,000 and will add 35,000 kw. to the Great Western company's generating resources. While designed primarily for standby service, augmenting the company's hydro-electric plant on the Feather River, it will materially benefit the entire system, particularly in the San Francisco Bay area. It will also be available for emergency service to the San Joaquin Light & Power Corporation system, through the Brighton-Wilson tie line.

The plant is a steel and concrete structure and occupies a 20-acre site. Three future units of the same size as the initial one are contemplated.

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Baltimore & Ohio May Electrify in Middle West

ELECTRIFICATION of the Baltimore & Ohio Railroad from Cumberland, Md., west through Fairmont, Grafton and Wheeling, W. Va., and to the Great Lakes is projected by that company in the not remote future, according to persistent reports. Extensive construction work, undertaken during the summer months, much of which is completed, is said to be preliminary to this electrification project.

With trains of 105 loaded cars leaving Holloway, Ohio, for the lakes, it is declared that the maximum in train tonnage with steam has been attained. To increase the load between the Fairmont coal fields and the lakes, railroad men are looking toward electrification. Electrification would also solve the difficulties of the mountain haul from Cumberland to Grafton.

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Buffalo to Unify Frequency —All Steam Service?

A CONSTRUCTION program to be launched by the Buffalo General Electric Company will, company men say, give the city the most reliable, economical and up-to-date electrical distribution system it is possible to devise. All 25-cycle service to small incidental power users in the outlying districts and to light and power users in the downtown section who now receive direct current will be changed to 60-cycle alternating current. The power supply to large industrial plants will, however, continue at 25 cycles.

About three years will be required to make the change. The area lying out Main Street near Transit Road will come first. From this point the work will proceed westward to and just beyond the Buffalo city line. It will then go on northward along the city line to River Road, including Kenmore. After this other sections will be changed as rapidly as possible.

It is possible, testimony before the New York Public Service Commission has developed, that the hydro-electric power now transmitted to Buffalo from Niagara Falls may be used in the latter city in the near future and that Buffalo may depend entirely on steam-electric plants now in existence, planned or under consideration.

American & Foreign Buys Argentina Power Plant

CONTROL of the Mendoza Empresa de Luz y Fuerza, the public utility company which serves Mendoza, the fourth largest city in Argentina, and surrounding territory, has been acquired by American & Foreign Power Company interests, which have also concluded negotiations for the acquisition of the properties owned by the Compañia de Electricidad de la Provincia de Buenos Aires in the cities of Mar del Plata, San Pedro, San Nicolas, Junin, Azul and San Luis, Argentina.

Mendoza is 65 miles from the Chile frontier on the direct rail line between Buenos Aires and Santiago, Chile. It has an estimated population of 175,000, and the entire territory now served by the Mendoza company has a total estimated population of 200,000. The company's generating capacity is 13,869 kw., of which 10,785 kw. is hydro-electric. There are 16,000 consumers.

Brief History of the "Electrical World"

The *Electrical World* (published under that name since 1883 and tracing its history back to 1874) is a consolidation of the *Electrical Engineer* (founded in 1882 as the *Electrician*) and the *American Electrician* (founded in 1896). Final consolidation under the title of *Electrical World* took effect on January 1, 1906, the *Electrical World* and the *Electrical Engineer* having been acquired by the McGraw Publishing Company in 1899 and amalgamated as the *Electrical World and Engineer*, and the *American Electrician*, a McGraw monthly, having been absorbed seven years later.

The roster of past editors of the *Electrical World* includes Carl Hering, Louis Bell, W. D. Weaver, T. C. Martin and many other men prominent in the electrical industry —some, like those named, no longer living, and others, like C. O. Mailloux, A. S. McAllister, Frank F. Fowle, F. M. Feiker, D. H. Braymer and H. V. Bozell, still active in engineering and industrial service. L. W. W. Morrow is now editor and William H. Onken, Jr., senior editor. Allen M. Perry is managing editor. Other members of the present staff are: Earl Whitehorne, contributing editor; G. F. Wittig, statistical editor; H. M. Cameron and A. E. Knowlton, associate editors; F. C. Wells, news editor; E. R. Searles and E. M. Glennon, assistant editors; F. R. Innes, Western editor; H. S. Knowlton, New England editor; Walter C. Heston, Pacific Coast editor, and Paul Wooton, Washington correspondent.

Maryland Light & Power Unites Thirteen Utilities

CONSOLIDATION of thirteen electric utilities, with an estimated valuation of $1,800,000 in physical properties, is sought in a petition filed with the Maryland Public Service Commission on December 27. The consolidated concern, to be known as the Maryland Light & Power Company, will be a subsidiary of the Empire Public Service Corporation, which operates in fourteen states.

The companies to be merged are the Empire Public Service Corporation, Maryland East Coast Utilities, Betterton Ice & Electric, Home Electric Light, Antietam Electric Light & Power, Emmitsburg Electric, Midland Electric Light, Millington Light & Power, Trappe Electric Light, Love Point Light & Power, Somerset Electric, Suburban Electric Power and Cecilton Electric Light & Power Company.

The merger of the companies will give the Empire corporation operating utilities on the Eastern Shore and in southern and western Maryland. The Empire company has been for some months the owner of more than two-thirds of the capital stock of the Suburban, Home, Antietam, Emmitsburg and Midland utilities. More recently it acquired more than two-thirds of all classes of stock of the East Coast Utilities Company, which in turn owns all outstanding capital stock of the Maryland East Coast Utilities.

Two Texas Companies Merged at Fort Worth

MERGER of the Fort Worth Power & Light Company of Fort Worth and the Texas Electric Service Company of Dallas has been authorized. The new organization will have its offices in Fort Worth but will be known as the Texas Electric Service Company. It will operate in about 60 towns.

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Winter Meeting of A.I.E.E. Now Near

TENTATIVE plans for the winter convention of the American Institute of Electrical Engineers, to be held in New York on January 27 to 31, include ten technical sessions—two on Monday, one on protective devices and a joint session with the Illuminating Engineering Society on ultra-violet radiation; two on Tuesday, on power-system planning and selected topics respectively; one on Wednesday, on lightning investigations; three on Thursday, on transoceanic communication, welding and dielectrics, and two on Friday, on electrical machinery.

There will be, besides, the time-honored features of a public lecture, a smoker on Tuesday evening and a dinner-dance on Thursday. The Edison medal will be presented to C. F. Scott.

Tentative Program for A.I.E.E. Winter Meeting

PROTECTIVE DEVICES

January 27, 2 p.m.—"Metal-Clad Switchgear at State Line Station," A. M. Rossman, Sargent & Lundy, Inc.; "Development of the New Autovalve Arrester," J. Slepian, R. Tanberg and C. E. Krause, Westinghouse Electric & Manufacturing Company; "Thyrite, a New Material for Lightning Arresters," K. B. McEachron, General Electric Company; "Extinction of a Long Alternating-Current Arc," J. Slepian, Westinghouse Electric & Manufacturing Company; "Use of Oil in Arc Rupturing, with Special Reference to System Stability," B. P. Baker and H. M. Wilcox, Westinghouse Electric & Manufacturing Company.

JOINT SESSION WITH I. E. S.

January 27, 8:15 p.m.—"Production and Control of Ultra-Violet Radiation," M. Luckiesh, National Lamp Works of General Electric Company; "An Ultra-Violet-Light Meter," H. C. Rentschler, Westinghouse Lamp Company.

POWER SYSTEM PLANNING

January 28, 10 a.m.—"System Connections and Interconnections in Chicago District," G. M. Armbrust and T. G. Le Clair, Commonwealth Edison Company; "Fundamental Plan of Power Supply in the Detroit District," S. M. Dean, Detroit Edison Company; "Fundamental Plan of Power Supply in the Philadelphia Area," Raymond Bailey, Philadelphia Electric Company; "Turbine-Governor Tests of Colfax Power Station," T. C. Purcell and A. P. Hayward, Duquesne Light Company; "Controlling Power Flow with Phase-Shifting Equipment," W. J. Lyman, Duquesne Light Company.

SELECTED SUBJECTS

January 28, 2 p.m.—"The Units of the Magnetic Circuit," A. E. Kennelly, Harvard University; "Calculation of Induced Voltages in Metallic Conductors," H. B. Dwight, Massachusetts Institute of Technology; "Induced Voltage of Electrical Machines," L. V. Bewley, General Electric Company; "Design and Application of a Cathode-Ray Oscillograph with Norinder Relay," O. Ackermann, Westinghouse Electric & Manufacturing Company.

LIGHTNING INVESTIGATIONS

January 29, 10 a.m.—"Résumé of 1929 Lightning Investigations," subcommittee on lightning (of committee on power transmission and distribution); "Cathode Ray Oscillograph Studies of Lightning on Transmission Lines," J. H. Cox and Edward Beck, Westinghouse Electric & Manufacturing Company; "Surge Characteristics of Insulators and Gaps," J. J. Torok, Westinghouse Electric & Manufacturing Company; "Lightning Voltages on Transmission Lines," R. H. George, Purdue University, and J. R. Eaton, Consumers Power Company; "Study of Traveling Waves on Transmission Lines with Artificial Lightning Surges," K. B. McEachron and W. J. Rudge, General Electric Company, and J. G. Hemstreet, Consumers Power Company; "Lightning Investigation on 220-Kv. System of Pennsylvania Power & Light Company," Nicholas N. Smeloff, Pennsylvania Power & Light Company, and A. L. Price, General Electric Company; "Lightning Investigation on Ohio Power Company System," F. W. Peek, General Electric Company, and Philip Sporn, American Gas & Electric Company.

COMMUNICATION

January 30, 10 a.m.—"The Post-War Decade in Submarine Telegraphy," I. S. Coggeshall, Western Union Telegraph Company; "Transoceanic Telephone Service—General Aspects," J. J. Pilliod, American Telephone & Telegraph Company; "Short-Wave Radio Transoceanic Telephone Circuits": (a) "Transmission Features of Short-Wave Radio Circuits," R. Brown, American Telephone & Telegraph Company; (b) "Technical Features of the New Short-Wave Radio Station of the Bell System," A. A. Oswald, Bell Telephone Laboratories, Inc.; (c) "Plan and Construction of Short-Wave Radio Systems," F. A. Cowan, American Telephone & Telegraph Company.

WELDING

January 30, 2 p.m.—"Cathode Energy of the Iron Arc," G. E. Doan, Lehigh University; "Resistance Welding," B. T. Mottinger, Federal Machine & Welder Company; "Electrically Welded Structures Under Dynamic Stress," Morris Stone and J. G. Ritter, Westinghouse Electric & Manufacturing Company; "Welding with the Carbon Arc," J. C. Lincoln, Lincoln Electric Company.

DIELECTRICS

January 30, 2 p.m.—"Conductivity of Insulating Oils," J. B. Whitehead and R. H. Marvin, Johns Hopkins University; "Behavior of Dielectrics," R. R. Benedict, University of Wisconsin; "Three Regions of Dielectric Breakdown," P. H. Moon and A. S. Norcross, Massachusetts Institute of Technology; "Ionization Studies in Paper-Insulated Cables—III," C. L. Dawes and P. H. Humphries, Harvard Engineering School; "High-Voltage Corona in Air," S. K. Waldorf, Johns Hopkins University.

ELECTRICAL MACHINERY

January 31, 10 a.m.—"Loading Transformers by Temperature," V. M. Montsinger, General Electric Company; "Recommendations for Safe Loading of Transformers by Temperature, W. M. Dann, Westinghouse Electric & Manufacturing Company; "Tap Changing Under Load for Voltages and Phase-Angle Control," H. B. West, Westinghouse Electric & Manufacturing Company; "Telephone Interference from Alternating-Current Generators Feeding Directly on Line with Neutral Grounded," J. J. Smith, General Electric Company; "Grounding Impedance," K. K. Palueff, General Electric Company.

January 31, 2 p.m.—"Generalized Theory of Electrical Machinery," Gabriel Kron, Lincoln Electric Company; "Quiet Induction Motors," L. E. Hildebrand, General Electric Company; "Transient Torque-Angle Characteristics of Synchronous Machines," W. V. Lyon and H. E. Edgerton, Massachusetts Institute of Technology; "Starting Performance of Salient-Pole Synchronous Machines," T. M. Linville, General Electric Company; "Ventilation of Revolving-Field Salient-Pole Alternators," C. J. Fechheimer, Westinghouse Electric & Manufacturing Company; "Synchronous Machines—V (Three-Phase, Short-Circuit)," R. E. Doherty and C. A. Nickle, General Electric Company.

Men of the Industry

A. E. Knowlton Joins "Electrical World" Staff

A. E. Knowlton, who has been connected with the electrical engineering department of Yale University and with the Public Utilities Commission of Connecticut for the past ten years, has

joined the editorial staff of the ELECTRICAL WORLD as associate editor. Mr. Knowlton brings to his new position a broad background of technical knowledge and engineering practice obtained partly through his academic work, but especially through the extensive personal contacts he has established in the public utility field.

As electrical engineer of the Connecticut commission Professor Knowlton has acted in a general advisory capacity on valuation, rates, mergers, standards of service, etc. He has represented the state on national committees developing standardized rules for electric meter performance, safe construction of electric power plants, transmission and distribution lines, superpower surveys, etc. He has also rendered private consulting service in such fields as induction and arc furnace efficiency, storage battery life and efficiency, system voltage regulation, elimination of factory power interruptions, improvement of factory power factor and valuation of electrical distribution systems.

At the present time Professor Knowlton is chairman of the meetings and papers committee and of the committee on awards of the American Institute of Electrical Engineers, not to mention membership in the publications committee and the committee on coordination of Institute activities. In the National Electric Light Association he has also been active, being at the present time a member of the power systems engineering committee. Professor Knowlton has also been prominently identified with the work of the American Engineering Standards Committee and since 1926 has served as technical adviser to the International Electrotechnical Commission.

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F. W. Funk Removes to Jackson

F. W. FUNK, formerly general superintendent of the electric department of the Penn-Ohio System, has been appointed manager of the Jackson (Mich.) office of Stevens & Woods. Since 1912 Mr. Funk has been actively identified with the public utility industry in Ohio, having received his early experience with the West Penn Power Company and the Westinghouse Electric & Manufacturing Company at East Pittsburgh. In 1912 he became assistant electrical engineer with the Northern Ohio Power & Light Company, Akron, designing and constructing substations, transmission lines and underground system in that city. Subsequently he served as electrical engineer with the Penn-Ohio System in Youngstown, district engineer for the Republic Engineers, Inc., and was associated in consulting engineering firm of Crippen & Funk of Youngstown. From 1920 to 1925 Mr. Funk, having established, with associates, the firm of F. W. Funk & Company, engaged in general engineering practice, especially in the steel industry. In 1926 he again became identified with the Penn-Ohio System, later becoming general superintendent of the electric department.

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G. E. CULLINAN, chairman of the executive committee of the National Electric Wholesalers' Association of America, will be one of the speakers at the annual dinner of the Electrical Wholesalers' Federation at the Savoy Hotel, London, England, on February 13, 1930.

E. B. Meyer Appointed to New Executive Position

Edward B. Meyer, formerly chief engineer of the Public Service Production Company, Newark, N. J., was elected vice-president of Public Service Production Company division of United

Engineers & Constructors, Inc. Mr. Meyer has passed successively through all of the engineering branches of the central-station industry. Mr. Meyer entered the employ of Public Service Corporation of New Jersey in 1903 as an engineering assistant. In 1906 he was made field engineer in charge of design, installation and maintenance of the entire underground conduit and cable system. In 1909 his duties were increased to include responsibility for special reports, engineering reports, estimates and supervision of construction work. In 1919, he was appointed assistant chief engineer, and with the formation of Public Service Production Company in 1922 became chief engineer.

He is a fellow of the American Institute of Electrical Engineers and is a member of that organization's board of directors and chairman of the finance committee and also is one of its representatives on the United States National Committee of the International Electrotechnical Commission as well as a member of the executive, law and power station committees. He is active in the N.E.L.A.

Financial and Statistical News

YEAR-END REVIEWS of the financial situation and outlook involve a wide variation of opinion. For the utility industry alone optimism is general, but in the business and industrial situation there are unfavorable factors. Changes in regulatory laws will undoubtedly be attempted in several of the states and this is bound to have some market significance.

——MARKET RECOVERY SINCE OCTOBER, on the other hand, indicates a degree of public confidence which is likely to overlook the less favorable factors.

Corporate Income Up 10 per Cent

GROSS CORPORATE INCOME of all corporations in this country for 1929 will probably be between $150,000,000,000 and $160,000,000,000, or an increase of 10 per cent over the preceding year.

Net earnings are figured at about $15,000,000,000, which will be probably 12 per cent higher than 1928. This does not mean that business was more profitable in itself, but that corporations did more business and made more money. The average ratio of net profits to gross sales and capital investment will probably be no larger than the normal of 10 per cent, it is predicted.

Some industries made spectacular gains, but these were mostly those that had not recovered their normal rate of increase in 1928 after the slump of 1927.

The industrial boom centered principally in the automobile business, in which the increase was about 30 per cent. Production increases of 14 per cent in pig iron, 12 in steel ingot, 14 in copper, 18 in plate glass, 30 in steel castings and 16 in gasoline were helped materially by the increased automobile output.

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Rise in Customer-Ownership Sales

SALES OF ELECTRIC light and power company stock in customer-ownership campaigns took a decided upward move in October, attaining a value of $21,542,000, according to reports received by the ELECTRICAL WORLD. It is estimated that 284,600 shares was thus sold, in 47,200 transactions. The value and number of sales were more than double the figures for September, when 187,200 shares, valued at $10,061,000, were sold in 20,700 transactions.

This makes the total for the first ten months approximately $132,700,000. On the basis of incomplete data for the last two months the total sales for 1929 are conservatively estimated at $145,000,000; this may be exceeded by several millions when all returns are received.

NEW SECURITY ISSUES OF ELECTRIC SERVICE COMPANIES IN DECEMBER

Name of Company	Amount Of Issue Par Value	Period Years	Class	Purpose	Interest Rate	Price	Per Cent Yield
Federal Public Service Corp.	$1,500,000	3	Convertible gold notes	To provide funds for additions and extensions to be made to properties of subsidiaries, to reimburse company in part for such expenditures already made and for other corporate purposes	6	97⅞	6.98
Central Maine Power Co.	3,000,000	26	First and general mortgage gold bonds, series D	To reimburse company for expenditures made for construction purposes	5	98½	5.10
People's Light & & Power Corp.	3,000,000	1	Notes	To retire unfunded debt, to reimburse treasury for additions and betterments and for other corporate purposes	5½	99½	6.06
City of Seattle (Municipal Light & Power System)	2,000,000	6-30	Gold bonds	To provide funds for certain additions and extensions to the plant	5	100	5
Detroit Edison Co.	13,516,000	20	General and refunding mortgage gold bonds, series A		5	100	5
Western Power, Light & Telephone Co.	2,500,000	1½	Gold notes		6	98.60	7.07
West Texas Utilities Co.	8,250,000	28	First mortgage gold bonds, series A		5	93	5.50
Central Illinois Public Service Co.	2,700,000	39	First mortgage gold bonds, series G	To partially reimburse company for cost of extensions and additions to its property	5	96	5.25
Illinois Power & Light Corp.	5,000,000	27	First and refunding mortgage gold bonds, series C		5	94½	5.37
Milwaukee Electric Railway & Light Co.	10,000,000	32	Refunding and first mortgage gold bonds, series B	To reimburse for funds provided for the payment of bonds at maturity and for expenditures for property additions	5	99½	5.04
National Electric Power Co.	4,000,000	..	Cumulative preferred stock		7	97¼	7.20
Pacific Lighting Corp.	2,000,000	..	Preferred stock	To pay current indebtedness and for other corporate purposes	6	100	6
Standard Gas & Electric Co.	6,450,000	..	Cumulative preferred stock	For investments in subsidiary and affiliated companies and for other corporate purposes	4	64½	6.20
Union Electric Light & Power Co.	15,000,000	38	General mortgage gold bonds series B	To reimburse treasury of company for expenditures made for additions and extensions to properties	5	100	5
Wisconsin Power & Light Co.	2,500,000	29	First lien and refunding mortgage gold bonds, series F	To reimburse for additional property acquired, for expenditures on additions and for other corporate purposes	5	96½	5.23
Tacoma (Elec. Light & Pwr. Dept.)	1,500,000	7-13	Bonds, series B	Additions and extensions	4½	100	4.75
Total	$82,916,000			Rights			
Total amount actually realized	81,554,250			Total financing for December	$81,554,250		

The reports do not in general indicate how many new customers were secured, as distinguished from additional sales to former purchasers, but in one case, at least, a clew to the ratio is furnished. In that campaign the new names were 2,541, out of a total of 5,344 sales; that is, 48 per cent were buying for the first time, while 52 per cent were adding to previous purchases. If this is a fair sample, the increase in customer owners can be taken as half the total number of sales.

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Kelvinator Shows Profit

THE KELVINATOR CORPORATION reports for the fiscal year ended September 30 last a profit of $1,221,383 for the year after all charges, compared with a loss for the previous year of $999,821. The statement shows current assets of $7,-161,701, against current liabilities of $1,165,991, a ratio of better than 6 to 1, compared with current assets of $5,-372,120 and current liabilities of $1,-407,251 a year ago. During the year the company purchased and retired $170,000 of its 6 per cent notes and closed the year with no bank loans.

Kelvinator organization has incorporated three new lines of electric refrigerators for home equipment and has expanded its distributor and dealer organization. Chief among its new lines is the "Ice-O-Thermic" tubes, invented and perfected by the Kelvinator engineering department for completely automatic faster freezing, the automatic maintenance of four distinct temperatures in the same cabinet, including a compartment for cold storage and new cabinet designs and construction.

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United Gas Improvement Increases Dividend

AN INCREASE in the annual United Gas Improvement dividend on the no-par common stock from $1 to $1.20 per share has been announced by John E. Zimmermann, president of the company, following a meeting of the board of directors.

A quarterly dividend of $1.25 per share on the $5 dividend no-par preferred stock and a quarterly dividend of 30 cents per share on the no-par common stock was declared by the directors, both dividends payable March 31, 1930, to stockholders of record February 28.

Control of Standard Gas & Electric Shared by Banking Group

CONTROL of the billion dollar Standard Gas & Electric system will be split between the H. M. Byllesby interests and an international banking syndicate headed by Harris, Forbes & Company if plans now in process are consummated. Under reorganization plans, Standard Power & Light, formerly a subsidiary of Standard Gas & Electric, becomes the top company of the entire organization. The interest of the banking group centers in the United States Electric Power Corporation, which was organized last September.

Conditions leading up to the present dual control proposal date back some time when the banking group referred to acquired substantial amounts of Standard Gas & Electric common stock and later segregated this stock in the hands of United States Electric. Litigation arose over common stock representation on the board of the parent company. An agreement was finally reached whereby both groups appear to be adequately represented on the board of Standard Power & Light Company and this is stated to afford adequate financial backing for the rapidly developing system of properties.

The plan of reorganization submitted to shareholders involves the transfer of all assets of Standard Power & Light to Standard Gas & Electric. In return for this and other considerations is suggested: The asssumption by Standard Gas & Electric of principal and interest of $24,000,000 6 per cent gold debentures, due 1957, of Standard Power & Light; the surrender by Standard Gas & Electric for cancellation all outstanding participating preferred stock of Standard Power & Light—the voting preferred stock; the issuance by Standard Gas & Electric to Standard Power and Light of 220,000 no par shares of $7 cumulative prior preference stock of Standard Gas & Electric and 600,000 shares no par common stock of Standard Gas & Electric.

The banking group associated with Harris, Forbes & Company includes also United Founders Corporation, American Founders group, Hydro-Electric Securities Corporation, W. C. Langley & Company, A. C. Allyn & Company, Albert Emanuel & Company, J. Henry Schroder Banking Corporation, Seaboard National Corporation, J. Henry Schroeder Corporation, London & Societe de Generale Belgique.

To consummate the reorganization shareholders of Standard Power & Light Company are asked to indorse the following changes in capitalization:

Issuance of 1,500,000 shares junior preferred stock.

Issuance of 1,500,000 shares "new" common stock.

Issuance of 1,500,000 shares series B common stock.

Reduction of (voting) participating preferred stock from 3,300,000 to 2,927,-014 shares, the amount outstanding.

Reduction of present authorized common shares from 800,000 to 440,000, the amount outstanding.

Stockholders of Standard Gas & Electric will vote on Jan. 7 on a proposed increase in authorized common stock from 3,000,000 to 10,000,000 shares, and on a decrease of authorized 6 per cent non-cumulative preferred stock from $3,000,000 to $1,000,000. This is the issue of $1 par voting stock which H. M. Byllesby & Company, upon full consummation of the proposed transactions, will surrender to Standard Gas & Electric against payment by the latter of $1 for each share so surrendered.

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BALTIMORE COMPANY DISSOLVES VOTING TRUST.—Trustees of the Consolidated Gas, Electric Light & Power Company of Baltimore have deemed it advisable to terminate its voting trust and to distribute the stock to the holders of voting trust certificates. The voting trust was formed on July 25 to insure the continuance of the present management and policies and avoid the risk of manipulation in the company's stock.

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SOUTHEASTERN RAISES DIVIDEND.—The Southeastern Power & Light Company declared a quarterly dividend of 40 cents on the common, placing the stock on a $1.60 annual basis. Previously the stock was on a 4 per cent annual stock basis. The dividend is payable January 20 to stockholders of record December 31.

Business News and Market Conditions

Radio Had Record Year Despite Overproduction

By O. H. CALDWELL
Editor "Radio Retailing"

IN SPITE of the stock market crash, radio closed 1929 with the biggest year in its history. Nearly four million radio sets were sold and total radio purchases by the public reached $750,000,000. Some overproduction developed during the late fall of 1929, but it is expected that such overstocks of manufacturers will have been absorbed to a considerable extent by the active Christmas business.

Dealers made money during the year and their own stocks were generally in good shape when the temporary buying lull came in November. Despite early fears that retail purchasing power might be destroyed by the Wall Street crash, the demand for radio sets quickly reasserted itself, and radio sales went ahead at a rapid pace.

Radio has thus been demonstrated anew to be an essential service to the average American home and has forever purged itself of the charge of being a "luxury line," so unfairly pinned upon it in public statements by several economists during the stock market crash. Collections on installment sales of radio sets have remained almost unaffected during the entire financial flurry, revealing unexpected strength in this method of financing home purchases.

The outlook for 1930 is gratifying. Out of every three homes in America, at least two are prospects for modern up-to-date receiving sets. Best information now obtainable from the radio industry indicates that there will be no new models or patterns offered during the early part of 1930. Instead, the trade and public will be given an opportunity to absorb existing equipment, thus stabilizing the whole price situation. Sales for 1930 should equal 1929, with the aggressive merchandising which the radio industry is now generally instituting to cash in on its unsaturated market. Outside selling, home demonstrations and increased advertising quotas will be the watchwords of the radio trade in 1930.

On the technical side, a remarkable expansion of the applications of "radio" (i.e., electron) tubes, extending far outside of radio itself, has been witnessed. Developed commercially by the great volume of tube sales in home receivers (70,000,000 tubes sold in 1929), the new science of "electronics" or electron amplification has now rapidly penetrated into a hundred fields. Talking movies, television, phonographs, amplifiers, picture transmission, aviation beacons, traffic signals, measuring devices, "wired wireless," machine controls and even crime detection and geophysical apparatus are only a few of the long list of applications which depend upon vacuum or electronic tubes for their operation.

DELINQUENT ELECTRICAL ACCOUNTS

NUMBER OF ACCOUNTS REPORTED

Division	November 1928	November 1929	Per Cent Increase or Decrease	Eleven Months 1928	Eleven Months 1929	Per Cent Increase or Decrease
New York	207	229	+10.6	3,147	2,744	—12.8
Middle and Southern Atlantic	134	139	+ 3.7	2,059	1,784	—13.3
New England	164	85	—48.1	1,480	1,417	— 4.2
Central	634	699	+10.3	8,184	7,228	—11.8
Total	1,139	1,152	+ 1.1	14,870	13,167	—11.5

TOTAL AMOUNTS REPORTED

	November 1928	November 1929	Per Cent Increase or Decrease	Eleven Months 1928	Eleven Months 1929	Per Cent Increase or Decrease
New York	$34,260	$53,577	+56.4	$459,564	$590,327	+28.4
Middle and Southern Atlantic	16,220	20,179	+24.4	264,031	242,692	— 8.0
New England	20,516	9,113	—55.5	184,958	198,663	+ 7.4
Central	79,282	89,626	+13.0	968,345	863,831	—10.8
Total	$150,278	$172,495	+14.8	$1,876,898	$1,895,513	+ 1.0

Timber Products Companies Are Merged

Announcement has just been made of the merger of American Forest Products Company, Inc., and the Naugle Pole & Tie Company into a holding company under the title of International Forest Products, Inc. The new organization will also acquire other companies engaged in the production and distribution of timber products, both treated and untreated, including poles.

Considerable importance is attached by the industry to the formation of this new organization. For some time members of the pole industry have discussed the advisability of associating their facilities and management in the interest of economies, price reduction and the elimination of waste. One of the principal objects was to secure economic zone production and distribution of poles. An important step apparently has been taken in accomplishing this end by the formation of International Forest Products, since the new organization is now in a position to distribute its products to the various parts of the country from the nearest sources of supply.

In addition to the companies named, the new holding company has associated with it the Wylly Tie & Lumber Company, Inc., New York City, and has division sales offices and treating plants in a large number of centers throughout the United States.

New York Metal Market Prices

	Dec. 24, 1929 Cents per Pound	Dec. 31, 1929 Cents per Pound
Copper, electrolytic	18	18
Lead, Am. S. & R. price	6.25	6.25
Antimony	8¼	8¼
Nickel, ingot	35	35
Zinc, spots	5.80	5.80
Tin, straits	39¾	39¾
Aluminum, 99 per cent	24.30	24.30

Market Conditions

HAND-TO-MOUTH buying has been the rule during the last week of the year in most sections. In all districts, however, there is a decided note of optimism with regard to business for the first quarter.

——THE EASTERN DISTRICT ANTICIPATES large electric railway business and some has already matured.

——ON THE PACIFIC COAST PRESENT REPORTS INDICATE that December was the best merchandising month on record. Early months of 1930 will probably see a continuation of brisk business.

EASTERN

—WITH 1929 *passing out under new high records for electrical equipment sales for the yearly period,* 1930 *has opened up with encouraging prospects for duplicating if not exceeding the levels which have been scored.*

—CURRENT ELECTRIC *railway business is prominent in that direction; with a week's transactions totaling more than $500,000 for this account, all indications point to unusual activity in this line.*

SUBSTATION equipment continues under good demand and leads in present central station buying in the Eastern district. Industrial business shows a tendency to lag. Orders for equipment for railway electrification programs continue to swell the business volume. The Michigan Central Railroad Company has placed a contract for electric locomotives of American Locomotive Company-General Electric Company type to cost $475,000. The New York Central Lines have given an order to the same companies for parts for electric locomotives to cost approximately $50,000. A traction company in central New York has purchased a quantity of miscellaneous switchgear, transformers and motors to an amount of $25,000. Demand for the last noted account looks bright and immediate transactions are in sight.

Central station business is of restricted character and current orders are for immediate requirements. Heavy machinery is quiet and no noticeable revival is anticipated under thirty to sixty days; there are, however, some excellent prospects in sight for prime movers and auxiliaries. A metropolitan power company has contracted with a New York manufacturer for transformers to cost about $150,000. A central station in New Jersey has purchased a quantity of switchgear from the same company to cost approximately $40,000. A municipality in Iowa has placed contracts for equipment for extensions in city-owned power station, including stokers to a company at Pittsburgh, Pa., and boiler units to an Iowa manufacturer. The demand for wire and cable is fair; power interests are limiting purchases close to actual needs, while industrial business trends in the same direction.

CONSTRUCTION PROJECTS

Board of Transportation, New York, will receive bids until January 7, for construction of substations Nos. 5 and 6, for rapid transit railway system. General Electric Company, Schenectady, N. Y., will build a factory branch and distributing plant at Bridgeport, Conn., to cost $100,000. Arrowhead Steel Products Company, Buffalo, N. Y., contemplates an addition to cost about $100,000. Dock Department, New York, will take bids at once for steel hangars, repair facilities, etc., at Floyd Bennett Field, Barren Island, to cost over $1,000,000, with equipment. Sinclair Oil Company, New York, is reported planning refining plant in vicinity of Linden, N. J., to cost more than $2,000,000. Rubel Coal & Ice Corporation, Brooklyn, N. Y., contemplates an ice-manufacturing plant to cost about $100,000. United States Rubber Company, Passaic, N. J., will soon break ground for an addition to cost $1,000,000. The Department of City Transit, Philadelphia, Pa., will receive bids until January 7, for electrical switching and control equipment for substations for subway system. Ford & Kendig Company, Philadelphia, Pa., will build a steam specialty equipment manufacturing plant to cost $750,000. Alan Wood Mining Company, a subsidiary of the Alan Wood Iron & Steel Company, Philadelphia, Pa., plans plant at Ivy Rock, Pa., to cost more than $500,000. Pittsburgh Plate Glass Company, Pittsburgh, Pa., has approved plans for plant at Santa Ana, Calif., to cost more than $2,000,000, and plans storage and distributing plant at Nashville, Tenn., to cost more than $150,000. Potomac Electric Power Company, Washington, D. C., has plans for addition to steam-operated electric power plant to cost over $2,000,000, also for an equipment storage and distributing plant to cost $200,000, and for a power substation to cost $50,000. Bureau of Supplies and Accounts, Navy Department, Washington, D. C., will receive bids until January 14, for insulated cable (Schedule 2521), and until January 21, for steam turbines and spares for New York and Philadelphia yards (Schedule 2493). The General Purchasing Officer, Panama Canal, Washington, will receive bids until January 17, for motors, transformers, cable, wire and other electrical supplies (Panama Circular 2516).

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SOUTHWEST

—NATURALLY *the past week has shown small activity in sales of stock sizes of apparatus.*

—LARGE INDUSTRIAL *and power companies are holding stocks down on account of inventory taking.*

SOME manufacturing companies report the present year's business the largest of any in their history. The only contract noted worthy of mention was for $5,000 worth of pipe line switching equipment for a southwestern oil company.

CONSTRUCTION PROJECTS

Board of Education, St. Louis, Mo., plans power house to cost about $80,000; also a shop building to cost $230,000. Springfield Tablet Manufacturing Company, Springfield, Mo., will proceed with superstructure for an addition to paper plant to cost about $75,000. Campbell Baking Company, Oklahoma City, Okla., has filed plans for baking plant to cost $200,000. James Sharp, Tulsa, Okla., and associates plan hydro-electric power plant on the Illinois River, near Forest Park, Ark., to cost about $175,000. Arkansas Light & Power Company, Pine Bluff, Ark., plan hydro power plant at Harrison, Ark., to cost $1,000,000; will also install ornamental street-lighting system at Harrison.

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NEW ENGLAND

—LITTLE ACTIVITY *in electrical equipment sales was reported in this district during the past week.*

—SMALL MOTOR *sales and a steady though somewhat lighter demand for general scheduled materials were of principal interest in the electrical market.*

—NEGOTIATIONS *for industrial equipment are marking time, yet in spite of a light December volume much optimism prevails.*

PROSPECTS for resumption of buying central stations supplies is encouraging in view of the announcement that about $500,000 will be spent in line extensions in western Massachusetts; in addition a new substation costing about $300,000 will be erected in this area, and reconstruction of a small Vermont hydro power plant and installation of 470 kw. automatic control is announced.

A recession in interest in electric heating furnaces is reported by one manufacturer, chiefly among the ma-

chine tool and automotive equipment manufacturers; on the other hand, the opinion is current in this district that forthcoming prospects for sales are good.

Small equipment and wiring device sales during the recent holiday season were greater in volume than last year, according to one manufacturer; merchandising gained over last year by about 20 per cent, as noted by reports from one prominent group of central stations.

CONSTRUCTION PROJECTS

Ceco Manufacturing Company, Providence, R. I., will carry out an expansion program at radio equipment plant to cost about $150,000. Board of Education, Meriden, Conn., will soon take bids for a trade school to cost about $100,000. Southern New England Ice Company, Hartford, Conn., plans ice-manufacturing plant to cost about $150,000.

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MIDDLE WEST

—GENERAL BUSINESS *in the Middle West section is hesitating for a short period in which to take inventory and to plan operations for the coming year. In most cases it is expected inventories of both raw materials and finished products will be found to be relatively small.*

—MOST BUYING *at the present time is of the hand-to-mouth variety and is generally expected to increase substantially after the first of the year.*

SOME of the interesting orders placed this week were for Western red cedar poles valued at $250,000, fir crossarms valued at $15,000, pole line hardware valued at $65,000, one 132-kv., three-phase, 60-cycle outdoor Oxide film lightning arrester and a carload of busbar copper.

Jobbers' sales are necessarily slow at this period of the year. From present indications the Christmas season just closed has been an exceptionally good one.

CONSTRUCTION PROJECTS

Lippmann Engineering Works, Inc., Milwaukee, Wis., will build a sand and gravel equipment manufacturing plant to cost about $75,000. Wisconsin Valley Power Company, Wausau, Wis., plans extensions in transmission lines at Eagle River to cost $300,000, and in vicinity of Minocqua, to cost over $30,000. Detroit News Publishing Company, Detroit, Mich., will build a printing and publishing plant to cost $1,000,000. Board of Education, Chicago, Ill., has plans under way for a technical high school to cost $3,000,000. Mechanical Universal Joint Company, Rockford, Ill., will soon take bids for an addition to cost over $100,000. Timken Roller Bearing Company, Canton, Ohio, contemplates a power plant at Boliver, Ohio, reported to cost more than $50,000. Queen City Baking Company, Cincinnati, Ohio, is completing plans for a baking plant to cost $250,000. Atlas Steel & Supply Company, Cleveland, Ohio, will build a storage and distributing plant to cost about $70,000. Ginn & Company, Columbus, Ohio, will build an addition to publishing plant to cost $80,000. Thierwachter Milling Company, Oak Harbor, Ohio, plans rebuilding of portion of grain and feed milling plant recently destroyed by fire with loss of about $150,000. Miami University, Oxford, Ohio, plans chemistry building to cost $125,000.

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PACIFIC COAST

—HOLIDAY BUSINESS *was spotty, some dealers reporting poor sales, others excellent business, especially in toasters, waffle irons, heating pads and percolator potstyles. All, however, found it a "high-spot" market of outstanding or bargain items.*

THE Pacific Gas & Electric Company reports 1,500 1-kw. heaters sold in November and about 2,500 in December, which is expected to be the best merchandising month on record. The Christmas outdoor lighting campaign proved eminently successful and was featured by elaborate electric decorative effect by many department stores. December staple and machinery business has held up surprisingly well and the early months of 1930 will see approximate purchases of $1,000,000 worth of transformers. Water shortage and cheaper fuels, especially natural gas, are expected to produce orders for several steam turbine stations. Railroad business is brisk and varied recent machinery orders include $50,000 worth of Westinghouse transformers for Portland, eight motor control cubicles, value $20,000, for a paper mill at Port Angeles, six induction regulators, value $15,000, three outdoor regulators, value $10,000, and three General Electric 1,250-hp. motors and controls, value $40,000, for station A in San Francisco. Other power company business covers two carloads of pole line hardware and two carloads of weatherproof wire. Radio business is good and features screen grid and combination models. Projected building includes an $800,000 church for San Francisco, $1,000,000 hotels for San Francisco and Oakland, a million-dollar aged home for Pasadena.

Plans and specifications have been approved and the Seattle Board of Public Works early in February will issue a call for bids for furnishing apparatus for two additional generating units below the new Diablo dam, a portion of the Skagit River municipal hydroelectric development, the installation to cost approximately $2,000,000. The initial bid call will involve two 60,000-kw. generating units, two 83,300 turbines and seven 22,500-kw. transformers. Later bids will be taken for switchboards, switches and miscellaneous equipment.

CONSTRUCTION PROJECTS

Southern California Edison Company, Los Angeles, Calif., plans extensions and improvements in power substations at several places to cost $200,000. Pacific Gas & Electric Company, San Francisco, Calif., will build a power substation at Chualar, Calif., to cost $55,000, and make extensions in transmission lines at Salinas, King City and vicinity to cost $50,000. Southern Sierras Power Company, Riverside, Calif., plans power substation at San Bernardino, Calif. Southern Pacific Railroad Company, San Francisco, Calif., will make extensions and improvements in engine house, shops and freight terminal at Stockton, Calif., to cost $150,000. Whittier, Gustine, San Jose, San Diago, Tulare, Oakland, Armona, Sierra Madre and Hanford, Calif., plan ornamental lighting systems. Portland Electric Power Company, Portland, Ore., plans addition to steam-operated power plant on East Lincoln Street, to increase capacity 46,000 hp.; and addition to hydro-electric power plant at Oak Grove, to increase capacity 40,000 hp. Clark Nickerson Lumber Company, Everett, Wash., plans extensions and improvements in mill to cost about $200,000. Waldo Lake Irrigation & Power Company, Spokane, Wash., contemplates a hydro-electric power plant, reported to cost more than $100,000. Bagdad Mining Company, Prescott, Ariz., plans copper ore reduction plant to cost more than $1,000,000.

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SOUTHEAST

—THE PRE-INVENTORY *period finds the usual lull in the electrical field in the Southeast, though the holiday trade was brisk and a reasonable volume of business was sustained last week.*

—A NUMBER *of large building projects will shortly get under way in Atlanta and prospects are for a brisk movement in supply lines in the first half of the new year.*

SOME ambitious bogies are being set in connection with central station activities, one of the larger companies in this section having announced a merchandise bogie of $3,100,000 for 1930. The only order of any particular size placed last week was by a Georgia company for four 6,667-kva. transformers. One company's small power and distribution transformer orders last week aggregated $6,500, while its crossarm orders totaled $5,000 and its creosoted pole purchases $4,000.

CONSTRUCTION PROJECTS

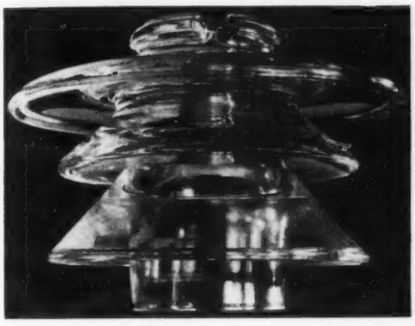
Chattanooga Stove & Foundry Company, Chattanooga, Tenn., recently organized, plans plant to cost $200,000. American Creosoting Works, Inc., New Orleans, La., will build a plant at Jackson, Tenn., to cost $300,000. Fontana Mining Company, Bryson City, N. C., contemplates crushing and flotation plant at mining properties to cost more than $500,000.

McComb Creamery & Ice Cream Company, McComb, Miss., plans plant to cost $100,000. Mississippi Utilities Company, Gulfport, Miss., contemplates extensions and improvements in power plant.

New Equipment Available

70-Kv. Pyrex Insulator

A ONE-PIECE, 70-kv., Pyrex insulator has just been released for sale by the Corning Glass Works. The successful manufacture of this insulator weighing 35 lb. and pressed in one solid piece, represents a distinct advancement in the art of manufacturing pressed dielectrics. The manufacture of Pyrex insulators



of this size on a commercial basis is possible and successful only because of the special properties of the material used in making Pyrex products. Its low co-efficient of thermal expansion permits a very fine degree of annealing, which can be easily controlled in manufacture and checked by inspection in polarized light. The addition of this insulator to the Pyrex line makes Pyrex insulators available for operating voltages between 6,600 and 70,000.

The qualities of transparency, giving visual indication of the condition of the insulator at any life interval, resistance to power arcs and impulse lightning voltage, elimination of corona and its attendant radio disturbances, one-piece construction, which characterize Pyrex insulator at any life, internal resistance found in this new insulator.

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Feeding Device for Automatic Welding

The General Electric Company announces an improved feeding device on its automatic welding head to meet advances in the art of automatic welding which call for an increased use of high welding speeds requiring heavier welding currents and larger sizes of electrode wire than heretofore ordinarily used. This improvement consists of the addition of geared drive to what was formerly the idler roller in the feeding mechanism. In this way the large sizes of wire, which are stiff and hard to feed without excessive pressure on the driving rolls, are positively fed without slippage, at a regular rate and with only a moderate pressure between the driving rolls, the manufacturer states.

This device also extends the uses for automatic welding by making it now possible to use curved nozzles so as to reach into otherwise inaccessible places and to weld in abnormal positions. The improved drive roll gears furnished on heads for these normal applications will accommodate any size wire from $\frac{1}{8}$ in. to $\frac{1}{4}$ in. diameter without changing gears. Below $\frac{1}{8}$ in. the gears are not needed and it is only necessary to remove one gear—that on the drive roll shaft. Sufficient pressure can then be obtained for these small sizes of wire by screwing down the adjustment on the binding roll.

For the majority of applications the present practice in automatic welding requires electrode sizes from $\frac{1}{8}$ to $\frac{1}{4}$ in. diameter.

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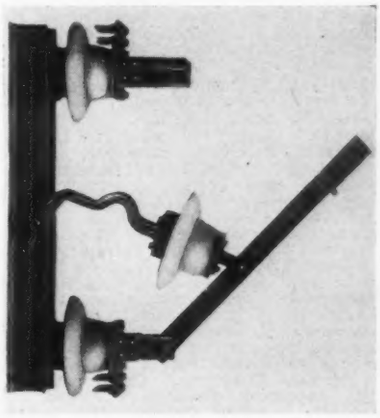
Full-Floating Contacts Are Self-Aligning

A NEW LINE of gang-operated disconnecting switches, a single-pole element of which is illustrated, is announced by

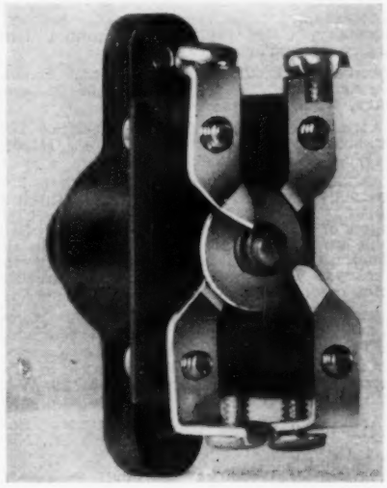


the Champion Switch Company, Kenova, W. Va.

The blade is provided with a pivoted insulator, the shaft of which passes through the base and is interconnected with the two other elements. The blade is of the reinforced truss construction and the contacts are full-floating, self-aligning type.

Push-Button Units for Industrial Control

A NEW PUSH-BUTTON UNIT for use with machine tools, elevators, conveyors and in other applications where a control station is desired as a built-in unit is announced by the Westinghouse Electric & Manufacturing Company. The units are so designed that they may be conveniently grouped on control stations. Since they may be mounted directly on the cover plate, wiring is greatly facilitated and the cost of installation reduced according to the manufacturer.



Other advantages claimed for the new product are: Compactness, neat appearance, ease of mounting, flexibility of arrangement, time saved in wiring and low cost.

The frame on this push-button unit, on which the mechanism is mounted, is of durable black micarta, capable of withstanding hard usage. The operating button of the unit can be furnished in either black or red.

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Self-Aligning Couplings

A NEW FLEXIBLE COUPLING, simple in design, self-aligning and having no springs, no pins and no bushings, is announced by the Poole Engineering & Machine Company of Baltimore. Its floating sleeves are supported on crowned teeth, being as free to align themselves as the ball and socket joint, according to the manufacturer.

This all-metal coupling has a combination dust-proof and centrifugal oiling feature accomplished by a new type of double flanged end plate, containing within its inner lip a deep felt packing for the exclusion of dirt and dust. The outer section is grooved and contains back drain oil holes which permit lubrication of the coupling while in motion. Ease of assemblage is claimed as a special feature.

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